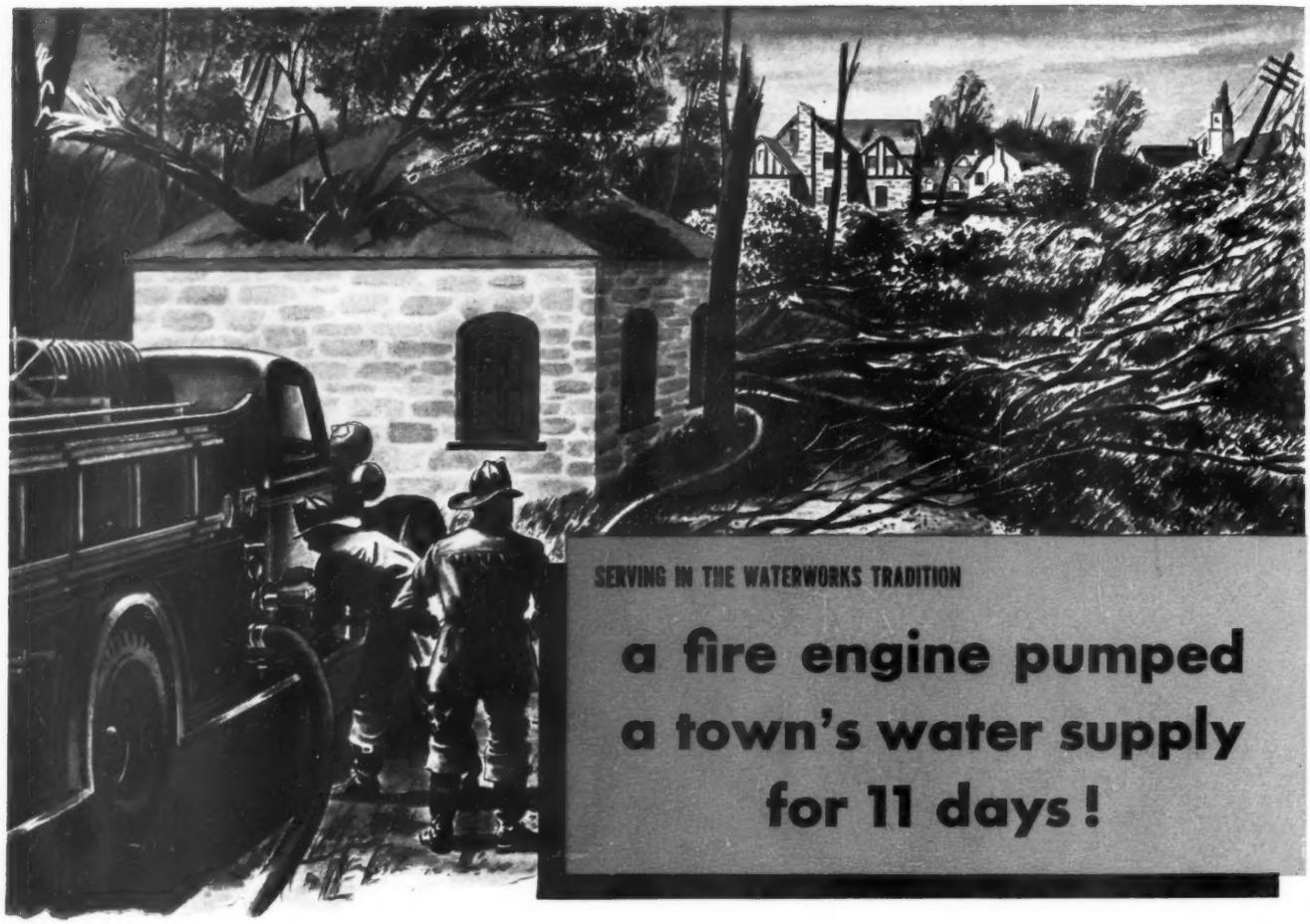
WATER WORKS & SEWERAGE



SERVING IN THE WATERWORKS TRADITION

a fire engine pumped a town's water supply for 11 days!

Emergencies are often the mother of invention —particularly for waterworks engineers. After a recent hurricane, the alertness and ingenuity of a small-town engineer kept the town's water distribution system operating safely when Dame Nature had done everything she could to defeat him.

Normally, this town's water supply comes from a dug well on the west shore of a lake. The water is pumped into the distribution system, and the excess enters a standpipe on a nearby hilltop.

When the hurricane struck, disaster followed disaster. Because of a washed-out dam, the lake overflowed . . . flooding the town's well and pumping station and washing out a water main. Then all the water drained out of the standpipe, and it blew over in the gale. The town was left without a water supply!

Quickly, the waterworks engineer arranged to have water brought in by truck from the neighboring towns, and he chlorinated this water before distribution. Meanwhile he obtained a pumping engine from a nearby city's fire department, and repaired the broken water main. Then for 11 days . . . until the electric motors at the pumping station could be baked out . . . the fire engine, with an emergency hypo chlorinator to treat the water pumped, supplied this town with water!

In emergencies such as this, waterworks engineers have found that it pays to have a supply of Per*chlor*on on hand. This super-test calcium hypochlorite has proved an invaluable standby because of its quick solubility and high chlorine content—more than 70% available chlorine.

Per*chlor*on has also been specified by many waterworks engineers for sanitizing small water systems, new mains, swimming pools and wells. Write us for your *free* copy of our illustrated booklet on Per*chlor*on, full of valuable data on water purification and sewage treatment.

Perchloron
REG. U.S. PAT. OFF.

PENNSYLVANIA SALT MANUFACTURING COMPANY
Chemicals
1000 WIDENER BUILDING, PHILADELPHIA

NEW YORK • CHICAGO • ST. LOUIS • PITTSBURGH • WYANDOTTE • TACOMA

OVER ONE HUNDRED NATIONAL DEFENSE PROJECTS—ARMY, NAVY, AVIATION, MARINE and ORDNANCE — ARE PROTECTED BY P.F.T. SEWAGE TREATMENT EQUIPMENTS

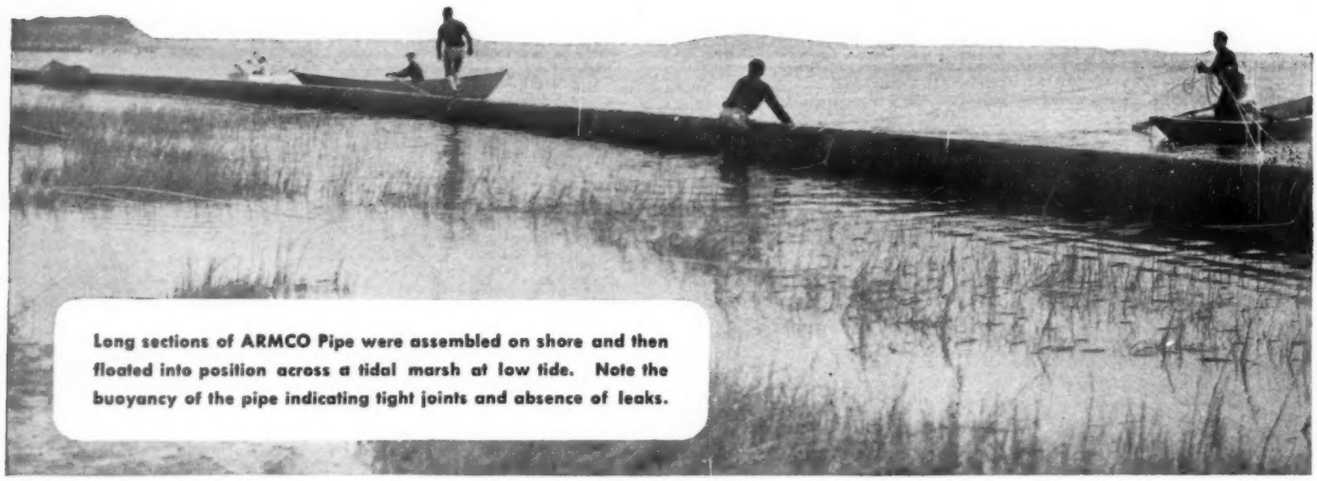
★ *No. of Installations* 111
★ *No. of Floating Cover Digesters* . 94
★ *No. of Rotary Distributors* 31
★ *No. of Siphons* 76
★ *No. of Sewage Sludge Pumps* . . . 25
★ *No. of Boiler Room Equipment Installations* 81

"We have met the enemy (*the dangers of improper sanitation measures*) and they are ours!"

P.F.T *Pacific Flush-Tank Co.*
4241 RAVENSWOOD AVENUE, CHICAGO
NEW YORK CHARLOTTE, N.C.
SEWAGE TREATMENT EQUIPMENT EXCLUSIVELY SINCE 1893

WATER WORKS & SEWERAGE, January, 1942. Volume 89. Number 1. Published monthly at 330 South Wells Street, Chicago, Ill. Per copy, 25c. Subscription rate, United States $2.00 per year; Canada $2.40 per year; Foreign $3.00 per year. Copyright, 1942, by Gillette Publishing Co. Entered as Second Class Matter, June 2, 1931, at the Post Office at Chicago, Ill., under Act of March 3, 1879.

"SEWAGE STAY AWAY FROM OUR SHORE!"



Long sections of ARMCO Pipe were assembled on shore and then floated into position across a tidal marsh at low tide. Note the buoyancy of the pipe indicating tight joints and absence of leaks.

• This eastern city said, "No more polluted beaches" and meant it. A previous sanitary sewer outfall failed structurally and clogged up due to open joints. The engineers recommended Asbestos-Bonded ARMCO Sewer Pipe and now raw sewage is safely deposited in the ship channel far from shore.

There is no worry about difficult sewer conditions when you use ARMCO Pipe. Shifting soils or unstable foundations will not disjoint an ARMCO Sewer. Sturdy band couplings produce a conduit of balanced strength and design. Joints can be made soil- and water-proof. Flexible corrugated metal design dispels the fear of crushing or breaking. A smooth bituminous pavement guards the bottom against erosion and a full coating of the same material protects against acids, alkalies and gases. Coating adhesion is assured by ARMCO's exclusive Asbestos-Bonding process.

Many major cities have benefited by installing Asbestos-Bonded ARMCO Sewer Pipe. Yours can too. Write us for the whole story. ARMCO DRAINAGE PRODUCTS ASSOCIATION, 95 Curtis Street, Middletown, Ohio.

Waterproof canvas closed the end of the pipe. Cutting the canvas admitted water to lower the pipe into position.

Hard clay beneath the sand made digging difficult, even for power shovels; so the trench was dynamited at low tide.

Asbestos-Bonded ARMCO SEWER PIPE

5 ELEVATED TANKS

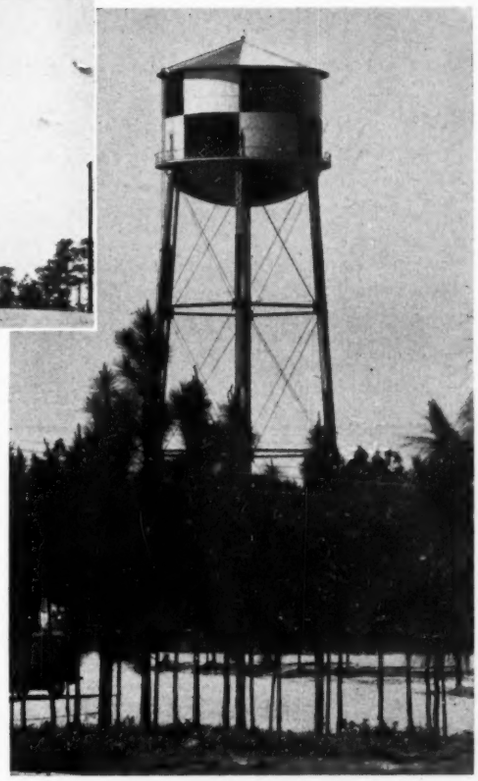
Provide Efficient Gravity Pressure

for

"DISTRIBUTED STORAGE" PLAN at a Mississippi Military Camp

Shown at the far left is one of the four 300,000-gal. Horton ellipsoidal-bottom elevated storage tanks installed at this camp. It is 116¼ ft. to bottom. At the immediate left is another of these tanks, the highest of them all—122¼ ft. to bottom. Shown directly below is a third 300,000-gal. unit, which is 101¼ ft. to bottom.

An important military camp in the South has accommodations for 68,000 officers and men. It is the training center for two well-known Divisions of the Third Army. Occupying 5,125 acres in a National Forest, the encampment contains 15,000 buildings and tent frames.



Water supply is obtained from 12 wells approximately 420 ft. deep, equipped with automatic, electrically driven centrifugal pumps. Each well produces an average of 550 g.p.m., to meet a daily consumption of between 110 and 125 gals. of water per man. The distribution system consists of 80 miles of mains, with principal lines laid out in a belt system. Valves are located so that any area may be operated independently.

To help maintain uniform distribution pressures, and to provide adequate reserves for fire protection, five elevated tanks are installed, evenly distributed to serve all areas uniformly. One 118,000-gal. and four 300,000-gal. tanks are used, the overflows of which are all at the same elevation. (Three of the 300,000-gal. units are illustrated on this page.)

CHICAGO BRIDGE & IRON COMPANY

Chicago.....2193 McCormick Bldg.	Birmingham..1586 North 50th Street	Philadelphia..1644-1700 Walnut St.
New York.3380-165 Broadway Bldg.	Tulsa.....1646 Hunt Bldg.	Washington..811 Washington Bldg.
Cleveland.2262 Builder's Exchange	Houston.....5615 Clinton Drive	San Francisco....1083 Rialto Bldg.
Havana.....402 Edificio Abreu	Detroit.....1551 Lafayette Bldg.	Los Angeles...1455 Wm. Fox Bldg.

Plants at BIRMINGHAM, CHICAGO, and GREENVILLE, PA. *In Canada:* HORTON STEEL WORKS, LIMITED, FORT ERIE, ONT.

NO, IT WON'T BE FROZEN
IT'S A MATHEWS

Bury a Mathews under a snowdrift. Spray it with water in sub-zero weather. Expose it to the gripping thrust of frost-heaved ground. Properly installed, a Mathews Hydrant will open easily, deliver full pressure, and drain freely when closed. Nearly 70 years of refinement have given it operating threads sealed from all internal or external water, a drain valve that works with the main valve, and a loose protection case which absorbs the thrust of frost-heaved ground as well as allowing removal or repair without digging. Investigate Mathews for your community!

MATHEWS HYDRANTS

Made by R. D. WOOD Company

400 CHESTNUT STREET, PHILADELPHIA, PA.
ESTABLISHED IN 1803

Throughout 1942
You can't go wrong with
this Time-Proved Dependable
Alkali Specification
"DIAMOND"
ALKALI
DIAMOND ALKALI COMPANY PITTSBURGH, PA., and Everywhere

JAMES B. CLOW & SONS . . . . . COSHOCTON, OHIO

BIRMINGHAM, ALABAMA . . . . NATIONAL CAST IRON PIPE

I always like to hear my boy say

"THANK YOU VERY MUCH"

and that is what I say to you today

KENT S. CLOW*

We haven't forgotten that loyalty to our customers is our best business asset. We certainly have not become "priority snooty." Therefore, if you get a letter from us asking for a priority rating before we can ship materials that you need, don't think that we have gone "high-hat" as the result of the crowded condition of our order book—far from it. We are merely complying with Government requirements and endeavoring as always to be helpful to our friends.

To preserve pig iron (our basic raw material), a rigid system of "priorities" has been instituted. In compliance with the Government's request, our stocks of raw materials and of cast iron pipe and fittings have been reduced to a minimum. They can only be replenished to fill orders that have an "A" priority rating. Right now, our plants are working double shift on orders for a large tonnage of pipe and fittings for army camps, air bases, powder plants, and many industrial plants directly and indirectly engaged in filling army and navy orders—all having high priority ratings.

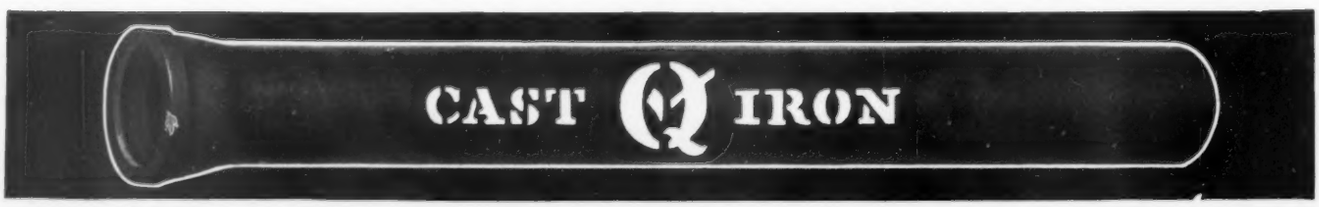
The priority rulings to date have no intention to entirely eliminate essential civilian services. It has been our experience that where a real need for pipe and fittings exists, a request for the necessary priority has usually received sympathetic attention.

We are most anxious to be helpful to you for we deeply appreciate that our future depends upon our ability to retain your friendship and good will during the present crisis. We pledge ourselves to do everything permitted by existing regulations to justify your continued support both now and after the present emergency is over.

For your understanding of our problem, for your kindly patience, and for your wholehearted cooperation—we most cordially say

"THANK YOU VERY MUCH"

*President of the Clow-National organization. General offices at 201-299 N. Talman Ave., Chicago, Ill.



ALUMINUM, THE FUTURE, AND YOU

RIGHT NOW OUR FACTORIES have only one interest: to make more Defense Aluminum than the world has ever seen before. Every resource we can muster is concentrated on that job.

WHEN AMERICA HAS WON THROUGH to make the world safe for our children to live in . . . the saying is: What a lot of aluminum is going to be available for everybody.

THE REAL POINT TO PONDER is how to get set to make that deluge of light metal work for you. In the kind of world we're going to have, sure as fate, the man who fails to call, *now*, on every resource at his command is going to be left at the post.

WE'VE COINED A WORD:

IMAGINEERING. It's the fine art of deciding where you go from here. It's the act of thinking out what you are going to face, and doing something about it now. *Imagination* plus *engineering* is a formula for the future you're going to hear more about.

A MAN CAN be producing for Defense at top speed and be imagineering at one and the same time. In fact, the more he is devoted to Defense now, the more he needs imagineering for ***THE DAY WHEN.***

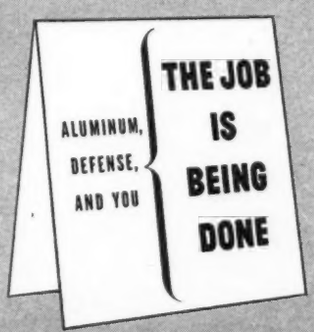
OBVIOUSLY, you can imagineer with steel, copper, glass, zinc, plastics, or what have you. We hope you will, because the world is going to need better use of all materials than it ever saw before.

THE CLOSER YOU GET TO FUNDAMENTALS the more quickly you must decide that the great need is going to be for the very things Alcoa Aluminum does best: Lightness with strength, resistance to corrosion, reflectivity, workability and all the rest of its powers all wrapped up in a low-cost package full of unlimited possibilities for you, personally, in your business.

TWO HEADS ARE BETTER THAN ONE. Already, many an industry, many a company, has called us into an imagineering session. We've seen things projected that will make news when the curtain can be lifted. Usually we've been able to help with some imagineering of our own.

DOES THIS SUGGEST ACTION? WE HOPE SO.

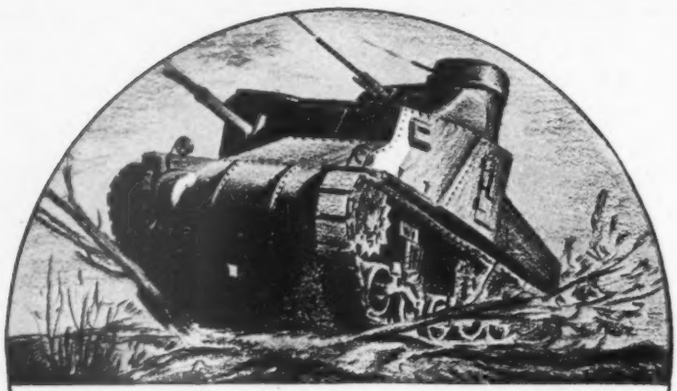
Aluminum Company of America, Pittsburgh, Penn.



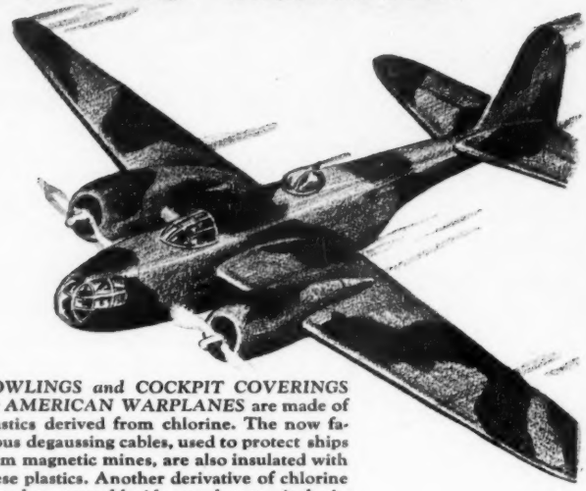
ALCOA ALUMINUM

CHLORINE GOES TO WAR

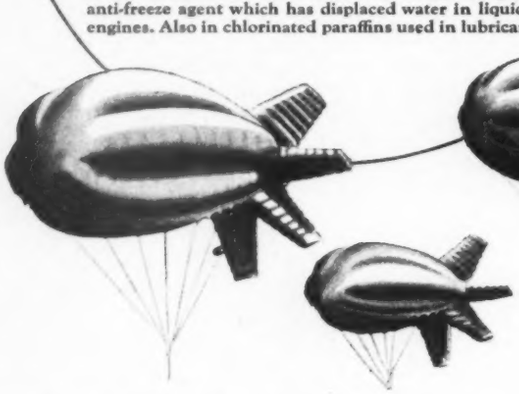
as America mans its battle stations!



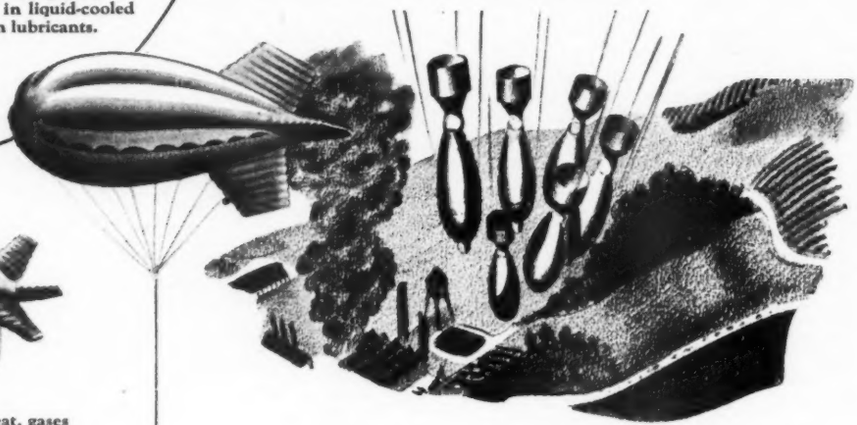
HI-OCTANE GASOLINE for U. S. TANKS and PLANES is produced from ordinary gasoline and tetraethyl lead. Rapid precision-fitting of tank and plane parts demands trichlorethylene, a degreasing solvent. Both tetraethyl lead and trichlorethylene require large quantities of chlorine. Chlorine is also used in the manufacture of diethylene glycol, the anti-freeze agent which has displaced water in liquid-cooled engines. Also in chlorinated paraffins used in lubricants.



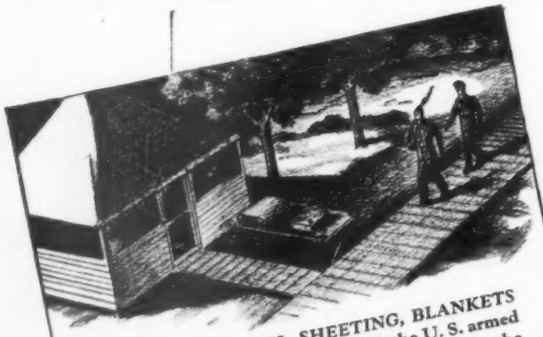
COWLINGS and COCKPIT COVERINGS for AMERICAN WARPLANES are made of plastics derived from chlorine. The now famous degaussing cables, used to protect ships from magnetic mines, are also insulated with these plastics. Another derivative of chlorine is carbon tetrachloride, used extensively in fire extinguishers for tanks, planes and trucks.



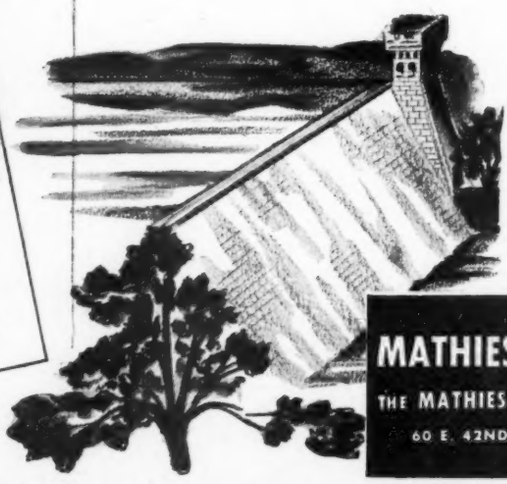
BARRAGE BALLOONS, capable of withstanding heat, gases and sunlight, are being manufactured from synthetic rubber. America's fast-growing production of synthetic rubber for protective balloons and other wartime needs has put an extra load upon the chlorine industry.



ALL-OUT PRODUCTION of MUNITIONS requires large amounts of chlorine, especially for processing of cotton linters for smokeless powder and other explosives.



TENTS, UNIFORMS, SHEETING, BLANKETS and PARACHUTE FABRICS for the U. S. armed forces are being turned out in millions of units by the textile industry. Thousands of tons of liquid chlorine go into the processing of these vital war materials.



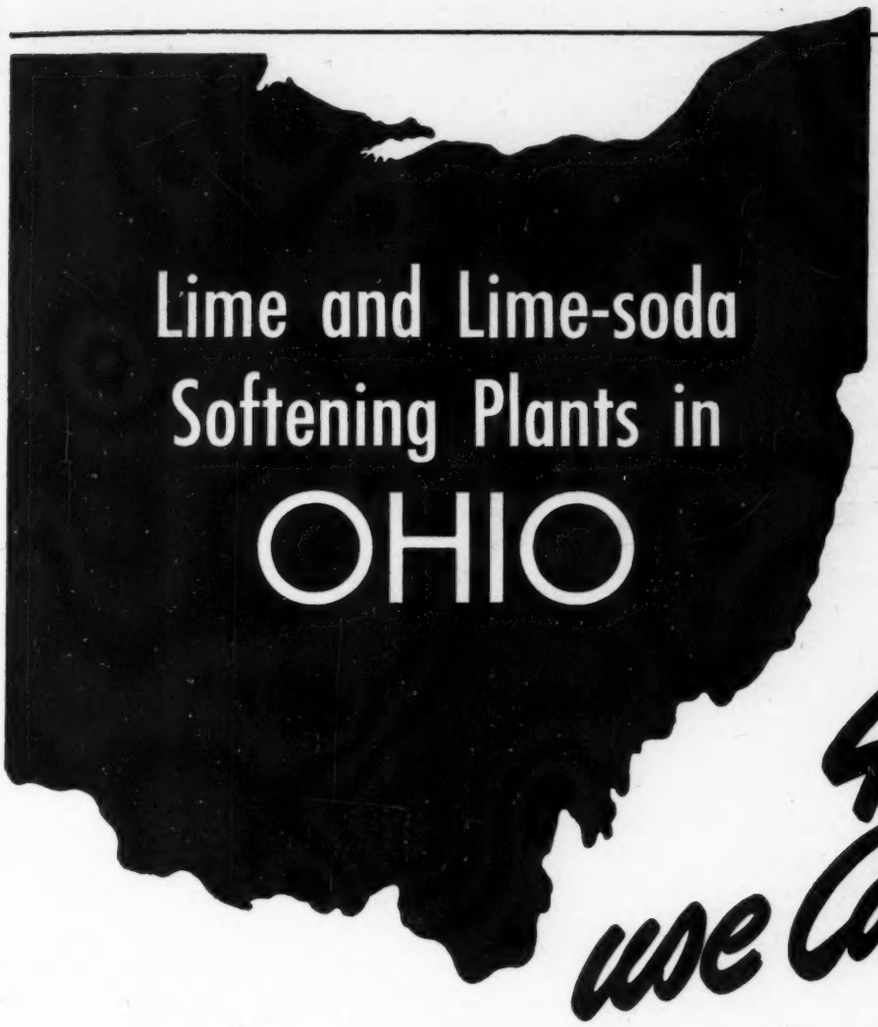
BACTERIA POLLUTION by ENEMY AGENTS is being guarded against by chlorine. Public water works are now required to double the chlorine residual of water as an anti-sabotage measure. U. S. bases and army camps also require large quantities of chlorine for water purification and sewage treatment.

MATHIESON CHEMICALS

THE MATHIESON ALKALI WORKS, (INC.)

60 E. 42ND STREET, NEW YORK, N. Y.

LIQUID CHLORINE . . . HTH . . . SODA ASH . . . CAUSTIC SODA . . . BLEACHING POWDER . . AMMONIA, ANHYDROUS and AQUA . . . BICARBONATE OF SODA . . . PH-PLUS (FUSED ALKALI) . . . DRY ICE . . . CARBONIC GAS . . . SYNTHETIC SALT CAKE . . . SODIUM CHLORITE PRODUCTS



PLANTS USING CALGON TREATMENT

ASHLEY	MEDINA
BALTIMORE	MENTOR
BLANCHESTER	MILFORD
CANAL WINCHESTER	MINERAL RIDGE
CENTERBURG	MONTPELIER
CHILLICOTHE	MOUNT STERLING
COLUMBIANA	MOUNT VERNON
COLUMBUS	MOUNT VICTORY
DEFIANCE	NEW RICHMOND
DELAWARE	NEWARK
DELTA	OBERLIN
DILLONVALE	ORRVILLE
FORT RECOVERY	PATASKALA
FOSTORIA	READING
GEORGETOWN	RIO GRANDE
GLENDALE	SEVILLE
GLOUSTER	SUNBURY
GRANVILLE	WEST JEFFERSON
HEBRON	WESTERVILLE
HUDSON	WOODVILLE
KENT	WYOMING
MARYSVILLE	YORKVILLE

45% use Calgon!

Calgon prevents calcium carbonate scale from filter beds to customer taps

FORTY-FIVE per cent of *all* the municipal lime and lime-soda softening plants in Ohio use Calgon Treatment.* Even more revealing is the fact that of 51 Ohio plants employing *some* form of water stabilization, *86% (44) are Calgon users.*

These figures are of particular significance because:

1. Ohio has more municipal lime-soda plants than any other state in the Union.
2. Calgon was first used in a municipal plant in Ohio — in May, 1938.

The use of Calgon by municipal plants has since spread rapidly throughout the U. S. In fact, 38% of all the U. S. lime and lime-soda softening plants pumping over one million gallons daily are now using Calgon.

Calgon added after the softening process stabilizes water throughout the system, prevents cementation of filter sand, and eliminates precipitation of calcium carbonate scale in mains, heaters and consumers' hot water pipes and heater coils.

In addition, Calgon is equally effective for preventing scale from high-bicarbonate waters, for controlling corrosion due to dissolved oxygen in water, and for preventing "red water" caused by precipitation of dissolved iron in well-water supplies.

If you have not as yet looked into Calgon's unique, economical advantages in treating city water supplies, you owe it not only to yourself but to all your water customers to do so at once. Send coupon *now* for a free sample and complete information.

**Source: U.S. Municipal Water Softening Plant Census,* Journal A.W.W.A., *December, 1941, with additions since July 1, 1941.*

calgon, inc.
300 ROSS ST. PITTSBURGH, PA.

Calgon, Inc.
300 Ross Street, Pittsburgh, Pa.
Gentlemen:
Please send complete information about Calgon for ☐ Stabilization of water ☐ Scale prevention ☐ Control of corrosion.

Name_____

Company_____

Address_____

City_____ State_____

EMERGENCY STERILIZATION *ANYWHERE!*

You can be prepared quickly—if you act now.

The pictures tell the story of %Proportioneers% Dual Drive (gasoline engine or electric motor) emergency Chlor-O-Feeders for:

EMERGENCY CHLORINATION — used to sterilize breaks, new mains, dead ends, floating reservoirs, and remote sections.

STANDBY CHLORINATION — to augment gas chlorinators during emergency overload periods or to replace them during repairs.

Dual Drive Chlor-O-Feeders provide complete chemical feeding emergency protection for water works.

Don't put all your eggs in one, EXPENSIVE, basket; have SEVERAL of these versatile emergency chlorinators on hand. Act now while there is time. Write Emergency Chemical Feeder Headquarters today.

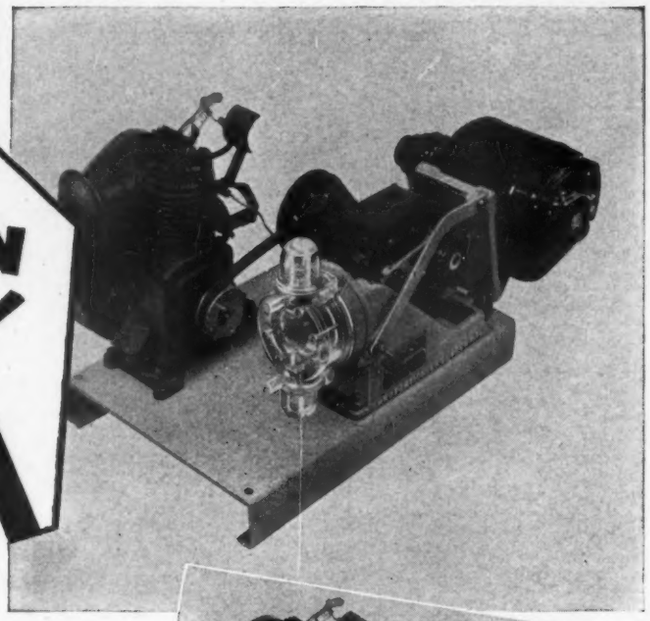


Fig. 1—Heavy Duty Dual Drive Chlor-O-Feeder for pressures up to 85 lbs.

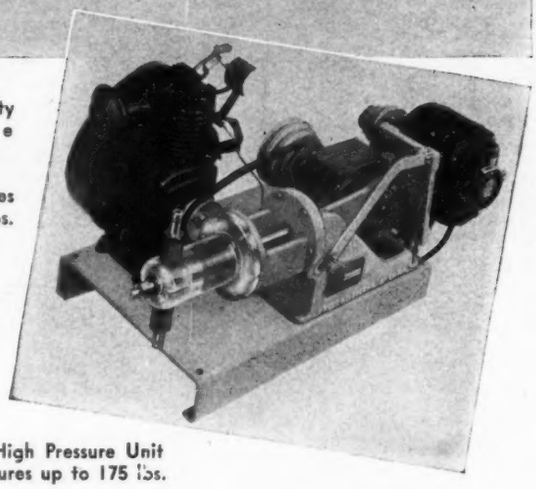


Fig. 2—High Pressure Unit for pressures up to 175 lbs.

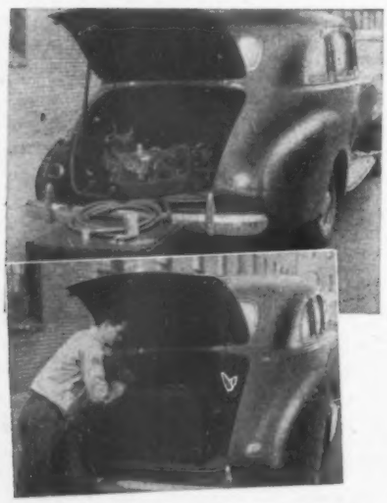


Fig. 3 and Fig. 4—Portable Emergency Unit fits easily in trunk of car.

%Proportioneers% Dual Drive Emergency Chlor-O-Feeder is the only moderately priced unit giving you these important advantages:

1. **FEEDS OVER 100 LBS. CHLORINE PER DAY.**
2. **ANY PRESSURE UP TO 175 LBS.—*no booster pump required.***
3. **PORTABLE—*LIGHT, EASY TO HANDLE*—see illustrations.**
4. **FEEDS ANY WATER WORKS CHEMICAL.**

%PROPORTIONEERS, INC.%

9 N. CODDING ST. PROVIDENCE, R. I.

WATER WORKS & SEWERAGE

PUBLICATION OFFICE
330 South Wells Street, Chicago, Ill.
E. S. Gillette, Publisher

EDITORIAL OFFICE
155 East 44th Street, New York, N. Y.
L. H. Enslow, Editor

COMING!

"Developments of 1941 in Sewage and Wastes Disposal"

Is the annual review of progress and trends in sewage and industrial wastes treatment practices, to be the feature of our February issue. This year the review is to be a joint contribution by two of America's best known sanitary engineers—

S. A. GREELEY and PAUL HANSEN,
Chicago, Consulting Engineers.

[To Messrs. Greeley and Hansen we feel especially indebted for the time and effort required of these consultants in this extremely busy year for engineers. On the same score our appreciation goes to Reeves Newsom whose, review of water supply progress is featured in this issue.—Ed.]

"The Maintenance of Pumps"

Constitutes an extremely useful and timely article in a period when the procurement of new pumps and replacement parts is so difficult, rendering the importance of adequate pump maintenance perhaps more important than has ever before been the case. Amongst other things of particular interest is the use of the novel "metallizing" process for the building up of worn pump parts, bearings, shafts, etc. "Metallizing", which consists of applying a mist of molten metal to the worn or damaged parts is a relatively new process effectively employed in industry but too little known or used in water works and sewerage practice. Those who have read other articles by this author, an AWWA, Goodell Prize Winner, will find his "Maintenance of Pumps" also of prize winning calibre. He is—

VANCE C. LISCHER,
Engineer in Charge of Production,
St. Louis County Water Co., St. Louis, Mo.

"The Treatment of Industrial Wastes"

The series of articles dealing with proven methods of treating industrial wastes which began in 1941 will be continued during this year. The authors contributing will be authorities who have specialized in industrial waste treatment. The series of articles, dealing with the treatment of various wastes, being contributed by E. F. Eldridge, of East Lansing, Mich., will continue during 1942. These important articles plus other material are to be eventually published as a text by the author. Those articles on treating wastes from the petroleum industry, began in 1941 by W. B. Hart and staff members of the Atlantic Refining Co. have been temporarily delayed due to the National Emergency, but will be resumed in due time we hope.

"The Control of Destructive Sewer Gases and Odors"

Is a recital of experiences in controlling the generation of odors and destructive sulphide gases in sewers and at sewage treatment plants. The article reviews those methods available to sewage works managers and discusses the relative merits of each. It is believed to be the most concise but thorough article yet developed on the widespread problem of controlling odors and the supression of sulphide gas attack on masonry and metal parts of sewers and treatment plants. The author—

CHAS. C. HOMMON, Supt.,
Sewage Treatment Works, Canton, Ohio.
(Also Consultant and Supervisor in Sewage Treatment.)

"The Care and Maintenance of Distribution Systems"

Is a paper which an experienced and progressive manager of a well operated water utility of moderate size was asked to prepare for use in operator's short schools. We consider it a well rounded out contribution which will prove of interest and value to operators of all sizes of water utility systems, and particularly so to the small system manager and those who have had limited operating experience. The author brands it as "elementary," but it is just the type of paper which we have been seeking for the benefit of our newer readers. The author—

FRANK C. AMSBARY, JR., Supt.,
Illinois Water Service Co., Champaign, Ill.

"Disposing of Sludge as a Fertilizer"

Constitutes the experiences of a sewage works superintendent in a small city in demonstrating the value of digested sludge as a soil improver, and selling it locally. The reader will want to hear how "Oshkonite" grows tomatoes averaging 1 pound each and how sludge sales were built up from $156.85 the first year to $810 two years later. The contributor is—

R. W. FRAZIER, Supt. of Sewerage,
Oshkosh, Wis.

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Chicago Office, L. H. Lingnor, Rep., 330 S. Wells Street. Cleveland Office, B. C. Brumm, Mgr., 2025 Lakeland Avenue, Lakewood, Ohio. New York Office, J. M. Angell, Jr., Eastern Mgr., 155 East 44th Street. San Francisco Office, Don Harway, Rep., 420 Market Street.

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WATER WORKS & SEWERAGE

VOL. 89, NO. 1 *A Gillette Publication* JANUARY, 1942

DEVELOPMENTS OF THE YEAR IN WATER SUPPLY

A Review of Progress and Trends of 1941

By REEVES NEWSOM*
Engineer-Consultant
NEW YORK CITY

NINETEEN FORTY-ONE — sabotage, emergency preparations, national defense, priorities, drought, floods, stricter priorities, intensified drought and, finally, War. And through it all the furnishing of water must go on and in many cases be increased many times over normal. Indeed, "These are times that try men's souls," just as in that other American Crisis. And certainly high on the list of those whose faith and fortitude and ingenuity are sorely tried is the water works operator.

Reeves Newsom

The range of unprecedented problems and activities in the water works field makes difficult the crowding of an account of the year into a single article. Those things growing out of National Defense and its ramifications no doubt deserve first attention.

National Defense

At the end of 1940 and early in 1941 the principal interest was in the steps to be taken to guard water works plants against sabotage, plans for emergency operation, the installation of more section gates on mains and perfected arrangements for immediate repairs and the development of inter-connections to auxiliary supplies. Protective lighting came in for considerable discussion and planning. A notable contribution was a paper by R. J. Swackhamer of the General Electric Company, delivered to the New York Section of American Water Works Association at its spring meeting in Syracuse and carried in the April number of WATER WORKS AND SEWERAGE.

Interest was high also in mobile emergency equipment, available for purchase, and also built by some of the larger water departments. These included chlorinators, valve control mechanisms, light-weight air compressors, power and light generators, pumps and complete purification plants all mounted, with power-drive where necessary, so that rapid transport to points of accident, sabotage or other emergency occurrences is possible.

Secretary of War Stimson in January appointed a committee of seven to study the problems of protecting sewerage systems, water mains, subways and buildings and safeguarding civilian population against aerial invasions. The name of the committee is the National Technological Civil Protection Committee. The membership is composed of W. D. Binger, Commissioner of Borough Works, Manhattan, representing the American Society of Civil Engineers, Chairman; W. H. Carrier, Syracuse, American Society of Heating & Ventilating Engineers; H. E. Jordan, New York, American Water Works Association; A. B. Ray, New York, American Institute of Chemical Engineers; Abel Wolman, Baltimore, American Public Health Association; J. S. Walsh, New York, American Society of Mechanical Engineers, and Scott Turner, New York, American Institute of Mining & Metallurgical Engineers.

Since the formation of the Office of Civilian Defense this committee has acted in a consulting capacity to it. Many of the activities, announcements and publications of O.C.D. are the outgrowth of the suggestions and recommenadtions of this committee. Included among the monographs which it has had a large part in developing are those on "Protective Construction"—"Blackouts"—"Air Raid Warning System." These documents are available at the Office of the Superintendent of

*Newsom and Aldrich, Engineers, New York City.

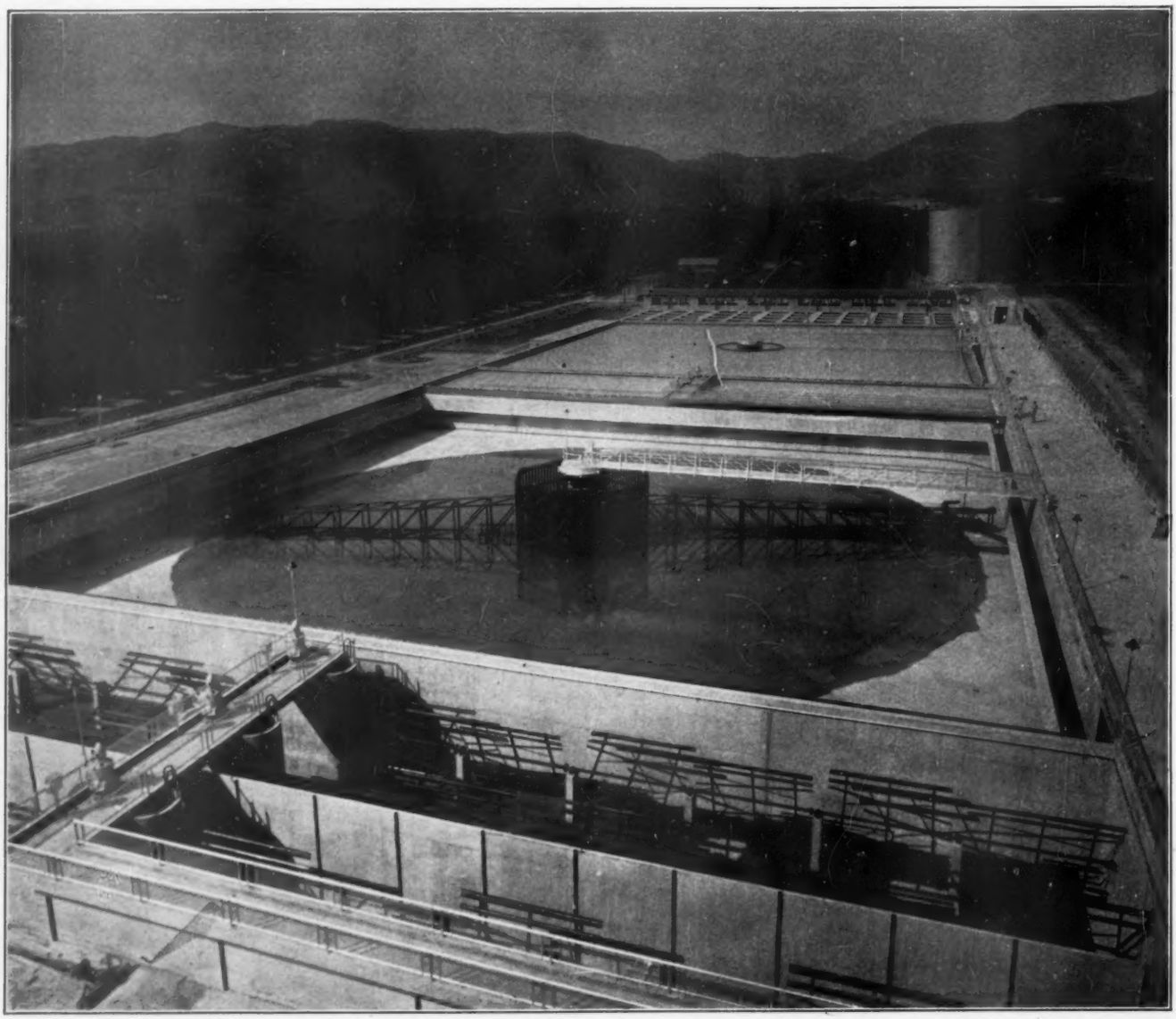
Documents in Washington, D. C. Similar treatises on which the committee has completed its work, but which have not yet been released, include those on—"Air Raid Shelters"—"Decontamination Procedure"—"Fire Defense" and "Camouflage."

This committee, as now constituted, has had added, representatives of the American Institute of Architects, the American Railway Engineers Association, the American Gas Association and the American Institute of Chemical Engineers. At the year end, the committee agreed to act also as an Advisory Board on Sanitary and Public Health Engineering to the Medical Division of O.C.D.

The two great conflicting water supply problems of the year were demands for increased service on the one hand and difficulty in getting materials and equipment on the other. The priority situation had two phases, both of which were serious to the water works industry as a whole. First, the problem of getting preference ratings so that extensions could be made fast enough to meet defense requirements. Secondly, and equally serious, the question of how to obtain for those communities where no direct defense activity was present sufficient materials and equipment to keep up the service of water, equally necessary where only regular work and living was continuing. Likewise the construction needed for increasing service to meet demands often developed into a magnitude beyond anything previously encountered. New facilities required in many cases were as great to several times greater than the entire community had previously needed and villages, towns and cities could not raise the money, or afford to be left with the fixed charges on their hands after the emergency revenues disappeared.

Priorities Appear

The battle of priorities began formally the week of March 10th when priority ratings went into effect on orders for structural steel needed by manufacturers of large cranes. Manufacturers were authorized to apply rating A-1-c to any orders given for steel bars, plates, shapes, castings and forgings. Because of the difficulties experienced by both defense and non-defense users of shapes during the several weeks prior and the series of conferences that had been in progress between the priorities division of O.P.M. and the major steel producers, this move was even then recognized as the opening wedge for the general application of priorities.



Softening and Filtration Plant of the Southern California Metropolitan Water District
A composite picture showing the near flocculator and clarifier empty and the remote flocculator and clarifier in service.

The first skirmish in the water works field took place following the refusal of the Director of Priorities to accede to the request of the Mayor of Cumberland, Md., under date of January 15, 1941, that orders for water works equipment and supplies, if certified by the city authorities as of emergency nature, have equal priority with all defense orders. O.P.M. stated its then position as being limited to issuing priorities in specific cases where some definite defense material was involved.

In the middle of April, 1941, Form PD-1 appeared. It was designed to accelerate deliveries of materials on the critical list for use on defense projects or other essential work which O.P.M. would recognize as important. To use it, it was necessary to attempt to place orders and either have them refused or have impractical delivery dates quoted. All such information must be recited on Form PD-1. For many months the successful result of such an application would be a telegraphic order to the supplier to deliver the requirements on a certain date. Late in the year the replies to a PD-1 application often took the form of an assigned defense rating (some one of the A's) which could then be filed with an order to one's supplier. This form (PD-1), the first one out, is still in use and has wide application.

Late in April, due to defense use of the major part of the aluminum supply, O.P.M. was compelled to institute rigid rationing of the amount available for civilian use. Non-defense use of aluminum was given B-1 to B-8 priorities. At May 1st, orders with B-8 were getting 10% of strong and 50% of low grade, with B-4, 60% of strong and 90% of low grade, while B-2 was getting 80% of strong and 100% of low grade.

At the Toronto Convention of American Water Works Association it was announced that under date of June 23rd the Director of Priorities had stated that the requirements of public health in the use of chlorine would be put on a basis of a direct defense application in receiving preferential treatment.

On July 26th liquid chlorine was put on the priority list and made subject to full priority control, but the O.P.M. order of July 30th to chlorine producers recognized the existence of the status of the letter of June 23rd from the Director of Priorities.

In the middle of July, Office of Price Administration and Civilian Supply recommended that in 26 fields, general maintenance requirements should be given preferential status. It was proposed to give an A-10 rating for general use and better rating for emergencies; that agencies wishing rating were to apply to O.P.M.; and that the rating, when issued, be sent, in form of copies of the order, to suppliers.

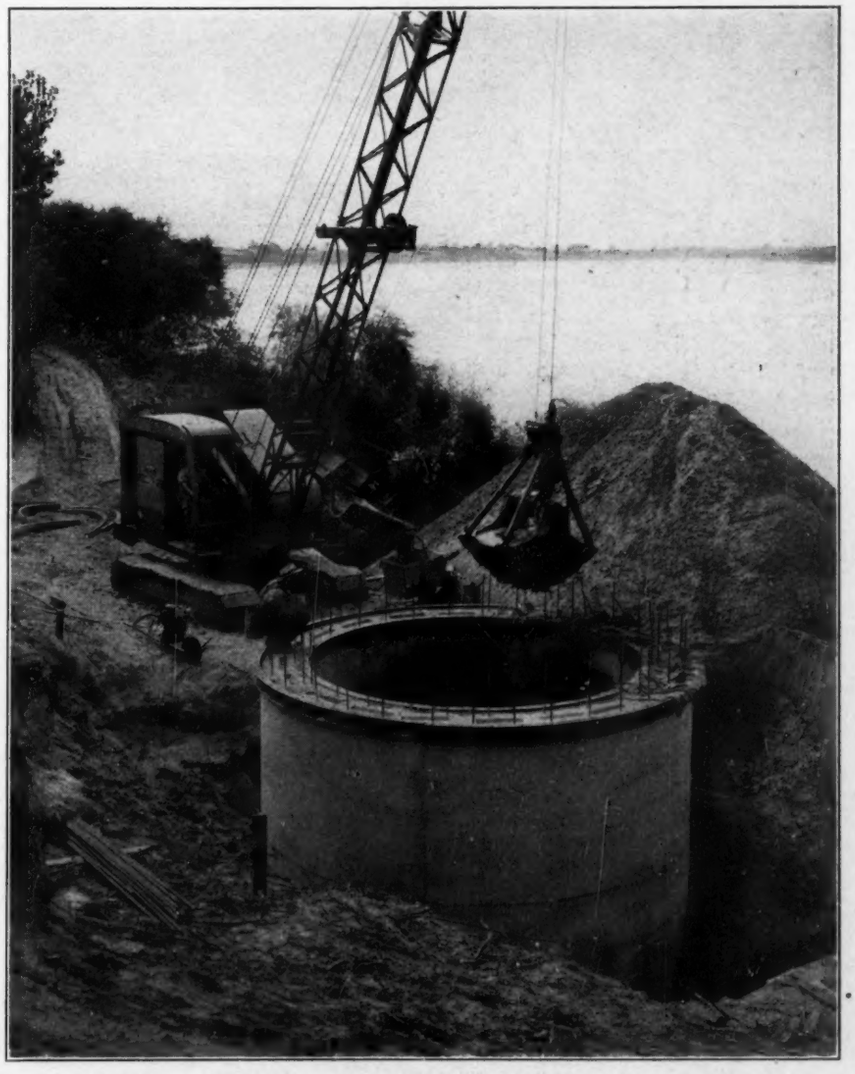
Later in July, O. P.M. announced its purpose to award project ratings to defense projects to cover all materials required on government projects, and materials on critical lists for all other defense projects, application for such ratings to be made by letter. In July the critical list contained approximately 300 items.

On August 8th, O.P.M. announced a plan whereby water works, among other essential industries, would be granted an A-10 rating for maintenance and repair parts upon application on Form PD-67. The successful applicant would get a P-22 order bearing a serial number which could be added to orders to suppliers. This plan was not carried out at this time and form PD-67 did not come into use.

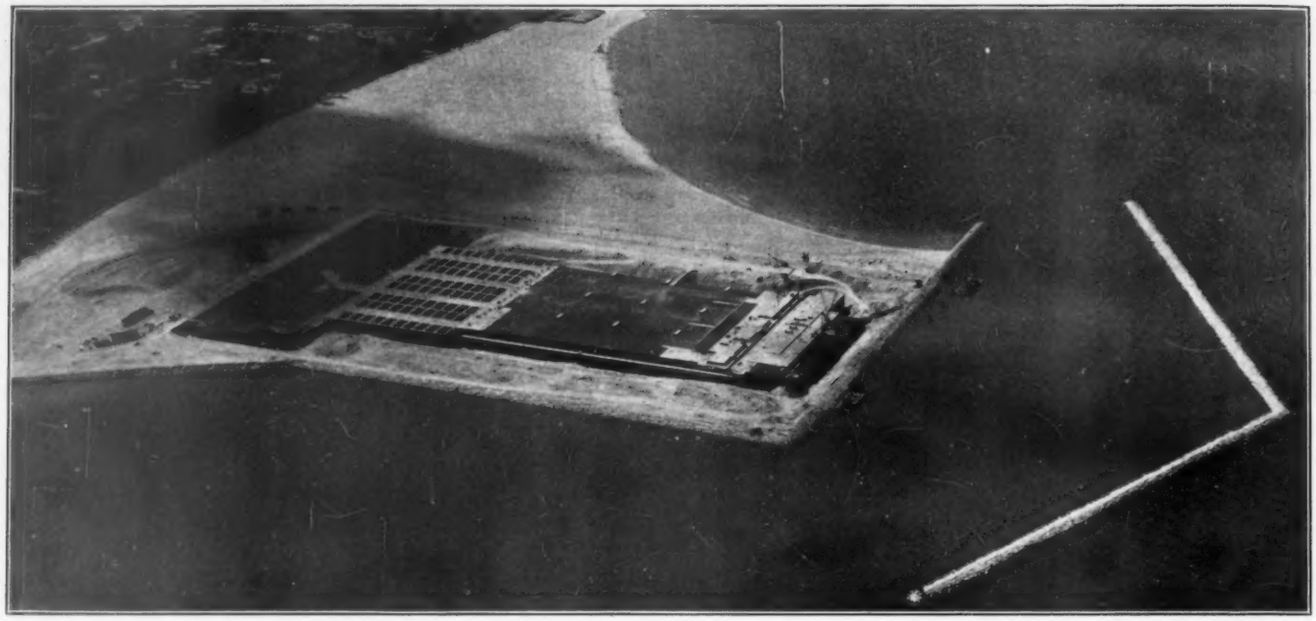
On August 11th, O.P.M. ordered steel, pig iron and silk under industry-wide mandatory control which brought the list of materials on the priority list to twenty. At this time deliveries of such items could be obtained only through the use of Form PD-1, or by obtaining a project rating through application by letter to the Priorities Division of O.P.M. although few of the latter applications were successful.

By August 20th, O.P.M. extended its project priority rating plan to cover needs of municipalities building essential services. First ratings for municipal work were B-1 to New York City on eight projects issued as P-19 orders although this form was originally intended only for defense projects. By this time, however, such rating offered little help on really scarce items, such as aluminum.

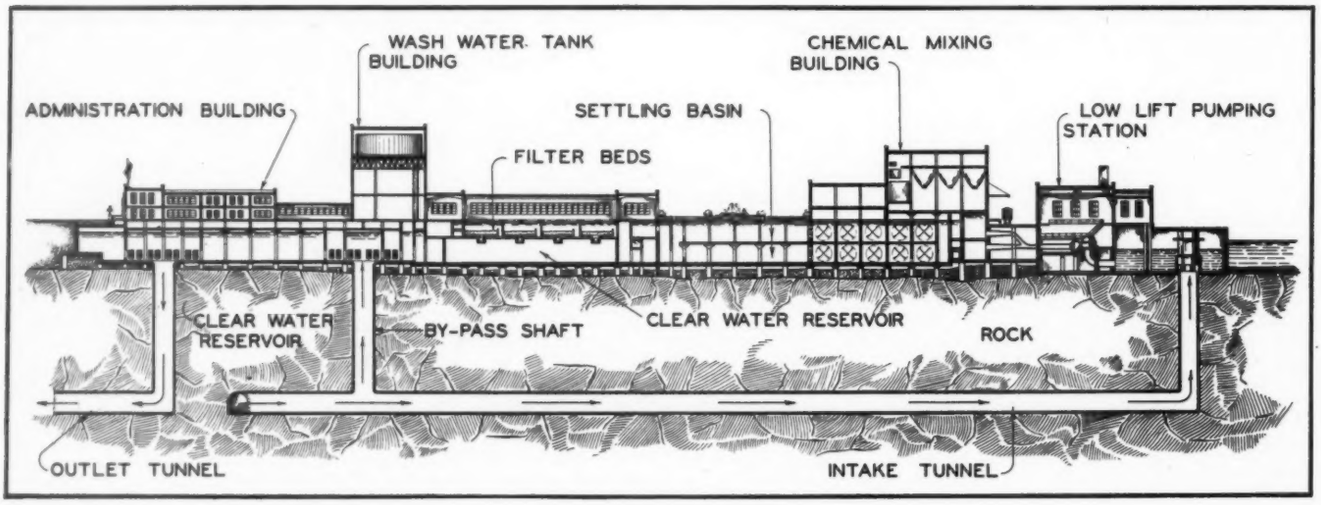
Finally, on September 17th, the long-heralded order governing preference ratings for maintenance and oper-



Sinking a Caisson for America's Largest Ground Water Project
One of the seven Ranney Radial Well Water Collectors which produce 65 M.G.D. for the Ohio Ordnance Works at Charlestown, Ind. From each caisson radiate 18 collector pipes in 3 tiers of 6 each, the "spokes" being staggered. In the background is the Ohio River.



(Photo by Chicago Aerial Survey Co.)



America's Largest Filtration Plant As It Looked Late in 1941

Chicago's 320 M.G.D. Plant Under Construction on Made Ground Out in Lake Michigan and a Typical Cross Section Indicating the Various Units and Water Flow. The Plant Is Designed to Deliver Up to 460 M.G.D. Rates if Necessary.

ating supplies for utilities was issued. It was called P-46 and provided for an A-10 rating for all utilities who accepted the order and such rating could be used on all orders for materials and equipment falling within the classes of maintenance, operation and minor extensions. There was considerable confusion as to certain of its provisions, particularly as to the meaning of the terms "minor improvements" and "other minor capital additions."

This order was quite generally accepted by the industry and the A-10 rating was effective in producing much of needed supplies. The restrictions in the amount of material to be purchased or withdrawn from inventory were found to be unworkable in many cases.

Under date of November 25th, O.P.M. issued an extensive addition to Order P-46 in the form of Amendment No. 2 (Amendment No. 1, dated September 26th, allowed the use of the fiscal as well as the calendar year 1940 in determining base inventory figures). This second amendment defined "minor improvements" as extensions requiring not to exceed $1,500 worth of material. It also allowed purchases and withdrawals of materials for maintenance, repair and operation of production and pumping facilities to be increased over 1940 in proportion to increase in output; delivery and withdrawal of inventory of additional meters equal to the increase in customers in any quarter; the exceeding of the provision of the order regarding withdrawals and delivery by 2% of dollar volume to care for unavoidable minor emergencies; and the acceptance of deliveries and use of material on hand in any amount needed for maintenance or the repair of damage resulting from fire, flood or other climatic changes provided that O.P.M. be immediately notified.

Amendment No. 3, dated December 11, 1941, provides that Producers, as defined in P-46, shall include all public water works whether or not they have accepted the original order and have used an A-10 rating on any orders placed with suppliers. The amendment also stipulates that utilities cannot initiate new projects for expansion of the property involving material costing more than $1,500 for underground work and $500 for work above ground, even though the material may be

in the company's or department's stores, *without first having obtained specific authorization for the work to be done.* Exception is made for projects which were 40% complete as of December 5, 1941.

Early in October, S.P.A.B. ruled that it would give priorities only to defense projects and to those "clearly essential to health and safety of civilian population." S.P.A.B. explained that this was not a stop-order for those who have or can obtain materials without a priority rating, but that they could go ahead and build.

The Priorities Division of O.P.M., late in October, announced that no more copper could be used for building construction after November 1st and that its use in the manufacture of building supplies and hardware was to cease January 1, 1942.

The project rating plan developed in August and September and crystallized in October into a set of instructions as to how to file an application in letter or brief form, has functioned only in a limited way involving long delays of eight or more weeks. In many cases the rating received was not particularly effective in getting the items of material most difficult to procure.

It was necessary to supplement the use of the priority rating given the project by PD-1 applications covering many of the critical items. The PD-1 form of application, often handled in 10 days, has throughout been the most effective method of getting action although it is designed for use with only one supplier in each instance. In view of the long delays and unsatisfactory results of the project rating plan, the use of the PD-1 form of application has now been extended unofficially to projects involving not more than ten suppliers and/or those where the total cost of material is less than $2,500.

The latest year-end development in the priority situation was an amendment to the Chlorine Preference Order, M-19, under date of December 20th, in which all uses of liquid chlorine are given ratings and all chlorine produced is allocated.

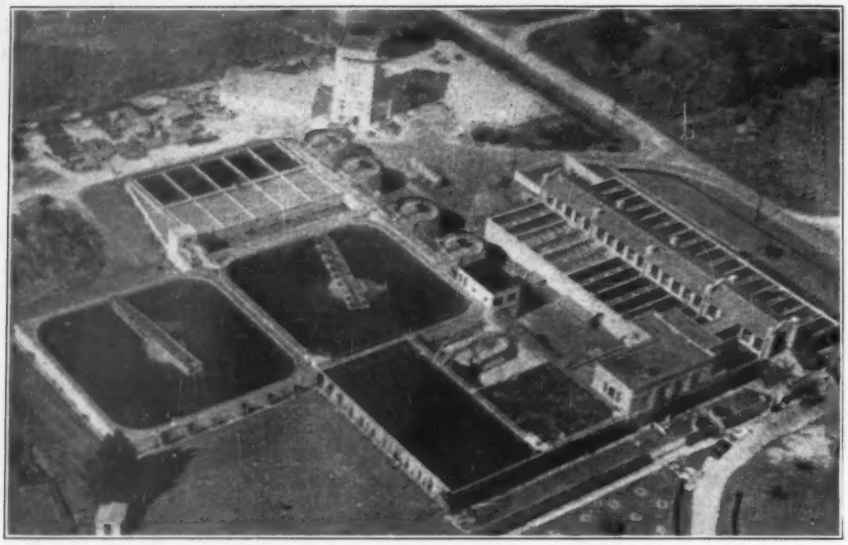
The treatment of domestic water and sewage are given the highest rating of A-2 and the treatment of industrial water is rated A-10. Users of chlorine must order chlorine for delivery in months after February 1st, on the 5th of the preceding month accompanying such order by Form PD-190 in duplicate. As a result of this order no chlorine can be obtained after February 1, 1942, except as authorized and allotted by O.P.M. based upon the information collected on the forms PD-190. It is therefore highly important that these forms be used and filed well in advance of the expected delivery date for chlorine supplies.

Defense Public Works

In the middle of February there occurred the first appearance of public works help for defense towns. The Lanham Bill, providing additional funds for defense housing, had a provision inserted to authorize the appropriation of $300,000,000 for public works "required in connection with defense housing and other defense activities." The money was to be spent by Federal Works Administration for outright federal construction or to be used for loans and grants to local public bodies. Loans and grants would be on whatever terms the Administrator thought proper.

This was withdrawn and on February 24th, President Roosevelt sent a message to Congress asking for $150,000,000 to build community facilities in towns where an acute shortage impeded essential national defense activities. In the message no terms were set out as a basis for making money available to various interested communities.

Partial View of the Battery of Spaulding Precipitators in America's Largest Softening Plant at Minneapolis



The 40 MGD Softening Plant of Miami, Fla.
An interesting case in which the city treated the water and wholesaled it to the local water company for distribution. In 1941 *Miami purchased the distribution system at a cost of approximately* $8,000,000.

At about the same time surveys in 60 areas to determine the adequacy of utility, school and recreational facilities were initiated by Frank Bane, Director of the Division of State and Local Cooperation of the National Defense Advisory Commission. This work was carried on by the use of 13 city managers loaned him for the purpose, who worked as consultants under the direction of regional staffs. This was taken to mean, at that time, that this Bureau would administer the $150,000,000 when an act was passed.

An appropriation of $150,000,000 was made on June 30th by the Congress coincident with the passage of the Lanham Act, and the Federal Works Agency was empowered to:

1. Acquire land needed for public works facilities.
2. Plan, design, construct, remodel, extend, repair or lease public works by contract or otherwise, and
3. Make loans or grants or both to public and private agencies for public works and equipment; and make contributions for maintenance and operation of public works.

Two conditions were expressly stated in the bill for a community to be eligible for aid. First, there must exist or impend an acute shortage of public works facilities that are necessary to the health, safety or welfare of persons engaged in national defense activities; and second, it must be established that such facilities cannot be provided by local governments without creating excessive debt or imposing an excessive tax burden.

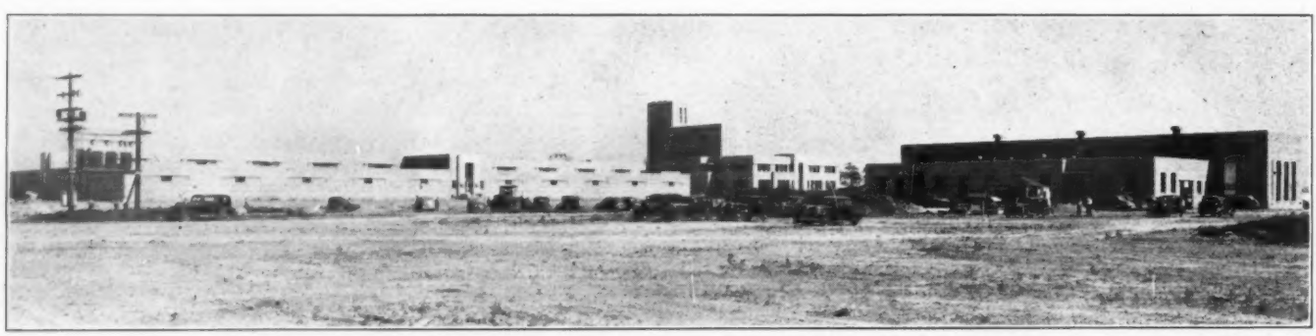
An unprecedented shift of population has occurred in consequence of defense efforts, estimates indicating that from 2,000,000 to 2,800,000 persons, exclusive of the 1,955,000 in the armed forces, have moved into defense areas.

Communities at once began submitting applications in great numbers ranging from small repairs or extensions to huge new construction projects—ranging from $1,500 to $10,000,000. To October 20th, the total number of applications was 2,952, with a total estimated cost of $844,459,415.

The first projects approved by the President under the Lanham Act were announced on August 18th, about two months after the program was authorized. Twenty-six projects, costing $5,765,531, were included in the first group. Eighteen were recreational and community buildings for use of troops near small communities. The entire cost of 15 of the 18 was to be borne by the Government. Local contributions were to be included in the balance, but the amounts were not yet negotiated. Under the procedure set up, therefore, Presidential approval did not mean that a project would necessarily go through.

At the same time the plan to handle this $150,000,000 through a new division of FWA was announced. This was called Defense Public Works Division and it was proposed to use such PWA organization and staff as remained as a nucleus for the formation of DPW in Washington and over the country. Eleven regional directors were appointed to be located in Boston, Philadelphia, Richmond, Jacksonville, Detroit, Chicago, Kansas City, Fort Worth, Denver, Los Angeles and Seattle. Colonel Gilmore was designated to direct the DPW. It was announced that financial arrangements would range from 100 per cent grants to any justifiable ratio of grants and loans, and that loans would bear 3 per cent interest.

By the middle of November $126,000,000 of DPW had been approved by the President, but until November 10th no project requiring funds from the city involved and requiring calling for bids in conformity with the requirements of DPW and OPM had been started. On that day a contract was signed by Newport News, Va., for a new 6.0 m.g.d. filter plant and pumping station and 17 miles of transmission mains involving $1,068,-



Toledo's New 80 MGD Filter Plant and High Service Pumping Station
Part of the $10,000,000 *Lake Erie Water Supply Project financed through P.W.A. and Revenue Bonds.*

Filter Operating Floor of Toledo's New 80 MGD Plant

000 of expenditure. Of this, $803,000 was contributed by the Government. OPM gave the Newport News project a rating of A-3.

At the beginning of December the number of DPW regional offices reduced from 11 to 7, effective January 1, 1942. Under the new groupings these are located in New York, Richmond, Va., Atlanta, Fort Worth, Texas, Chicago, Los Angeles and Seattle.

Construction Trends

There have been wide variations in the amount of construction work undertaken by the water supply industry in the last three years. It will be recalled that in the last seven months of 1938 some 1,100 water works projects with an estimated cost of approximately $170,000,000 were approved by PWA. This number compared with 2,100 projects at a cost of $260,000,000 approved in a 5-year period ending September, 1938. Most of these 1938 projects were not started in that year, so that, including the carry-over, the water works projects exceeding $15,000 minimum size contracted for in 1939 totaled roundly $163,000,000.

Because of the highly built up condition of the industry, the 1940 contracts for water works fell to $70,000,000. In 1941 there have been reported approximately 550 water supply projects undertaken totaling $77,000,000. The influence of the 1938 PWA spree still tends to hold down the total, and to that has been added the difficulty in obtaining materials and equipment in the latter part of the year. In spite, therefore, of defense needs, the total for the year is but 10 per cent above 1940.

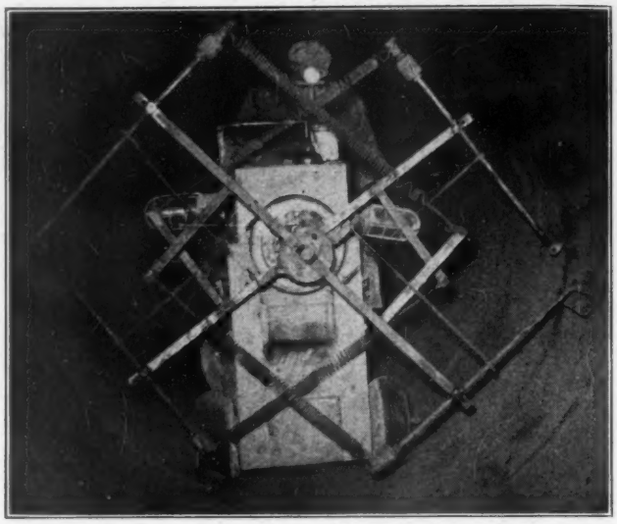
Of this total of $77,000,000 of water supply construction, approximately $23,000,000 is defense construction. This latter figure is, however, less than 30 per cent of the reported water supply awards during the year which total approximately $75,000,000. The southern states, which are having their largest construction period in history, accounted for about 42 per cent of the defense awards. The balance was 29 per cent in the Far West; 13 per cent west of the Mississippi; 7 per cent, Middle Atlantic; 5 per cent, Middle West; and only 3 per cent, New England.

During 1941 there were but 20 projects out of the total of 550 which involved $500,000 or more. Among the principal contracts awarded were the 145 mile,

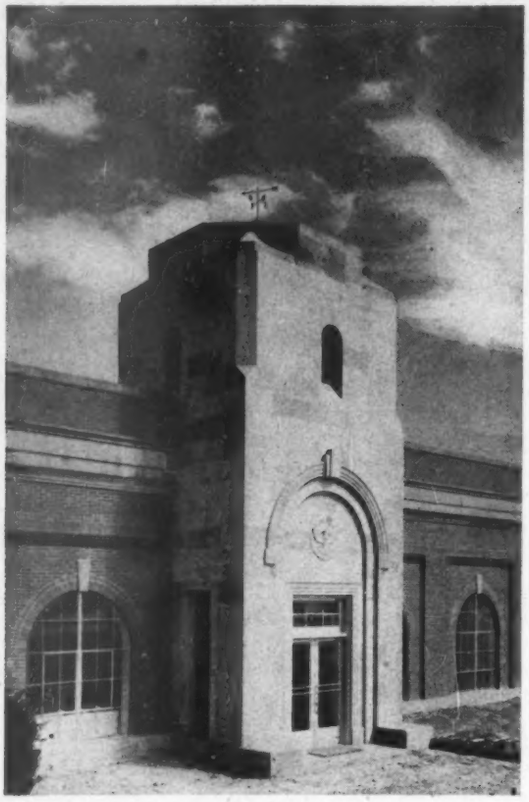
Toledo's 78" Supply Line

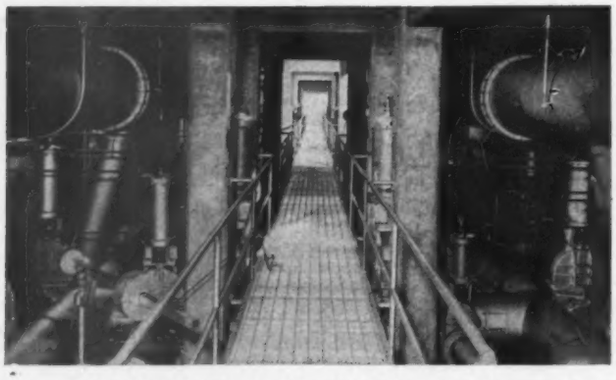
Of steel pipe protected by coating and lining of bituminous enamels and Dresser coupled.

18-in. steel pipe line to Key West from the Florida mainland, $3,000,000; the 16-mile, 40-in. steel line at Las Vegas, Nevada, from Lake Mead to a magnesium plant, $3,000,000; the San Vincinte Dam at San Diego, Calif., $2,400,000; and extensions to the Tampa, Fla., system, $2,000,000. Other large projects included were the Fall Creek Dam and Reservoir at Indianapolis, $1,600,000; tunnel construction at the Chicago Filter Plant, $700,000; water mains in several boroughs of New York City, $2,850,000; a filter and pumping plant and 17 miles of transmission mains at Newport News, $1,000,000; 13 miles of 42-in. to 12-in. pipe line at Waterbury, Conn., $900,000; and the Nepaug pipe line at Hartford, Conn., $500,000.



Lining Machine Used in Cement Lining Steel Mains at Toledo and Akron and a C.I. Main at Cincinnati by the "Centraline" Method





The 33 MGD Addition to Atlanta's Filter Plant to Make It a 55 MGD Plant

Above, is the new entrance and, below, the operating floor and the pipe gallery of many interesting features.

Major Projects Completed or in Progress

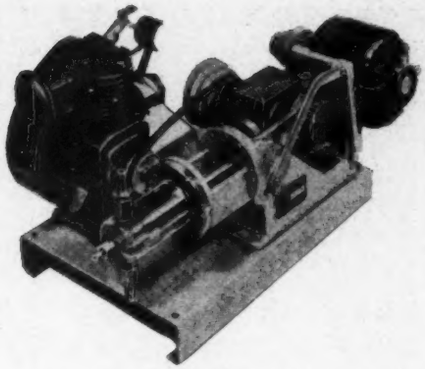
A number of large projects that have been under way for a few years have been completed and put in operation during 1941. Those at Chicago and New York have made substantial progress.

World's Largest Ground Water Project

The defense program is responsible for the rapid completion of one unique source of water supply. The largest single ground water project in the world was constructed between November, 1940, and June, 1941, at the War Department's smokeless powder plant at Charlestown, Indiana. It is a radial well installation with a maximum capacity of 49,000 g.p.m. It is three times the size of the radial well built in 1937 at Canton, Ohio, until now the largest of this type built.

The project comprises seven 13-ft. inside diameter collectors spaced 1,800 ft. apart along the Ohio River, about 100 ft. inland from the Ohio River bank. The collectors are from 80 to 110 ft. deep with a 7-ft. thick reinforced concrete plug at the bottom. Just above the plug there are driven horizontally into the water bearing strata from 10 to 14 slotted screen pipes. These pipes are 8 in. in diameter and are jacked out through 10-in. port holes. They are of $\frac{3}{8}$-in. copper bearing steel plate punched with 2-in. by $\frac{3}{8}$-in. slots.

Each pipe has a hollow cast steel conical point welded to the outer end of the first section. A 2-in. hole in the center of the point has a 2-in. pipe through it which leads back through the slotted pipe to the jack frame and through which fine sand and gravel flow from in front of the advancing point. This creates a gravel



Proportioneer's "Chem-O-Feeder"
Designed particularly for general utility and emergency duty—has dual electric and gas-engine drive for "all out" service.

Wilson's Unique "Pulsafeeder"
For feeding hypochlorite or other chemical solutions.

pack of from 3 ft. to 6 ft. in diameter around the 8-in. slotted pipe. The longest screen pipe was 257 ft. and they average 1,280 ft. to each collector. Economy in installation, where a large quantity is required, and the fullest utilization of the available ground water storage, low infiltration velocities and long life for screens are among the advantages claimed.

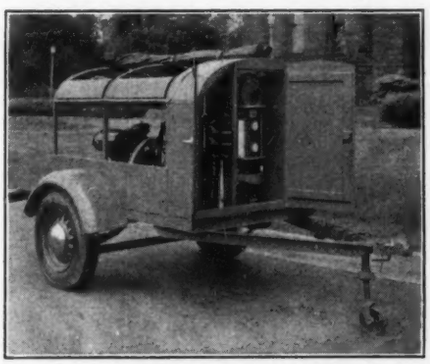
Pre-stressed Concrete Reservoirs and Tanks

The East Bay Municipal Utility District at Oakland, Calif., continues the use of pre-stressed concrete to construct reservoirs for equalizing and storage in the hilly terrain. Starting with 200,000 gallon tank in 1934, sizes have gone up until the last one, finished in 1940, was 160 ft. in diameter, 24 ft. deep and holds 3.5 m.g. Four other such reservoirs, one 1.0 m.g. and three 3.0 m.g. are under construction. The tanks have dome roof and the reinforcing steel is pre-stressed by use of limit-torque wrenches, the tension being controlled by the shearing of a copper nail of given shearing strength.

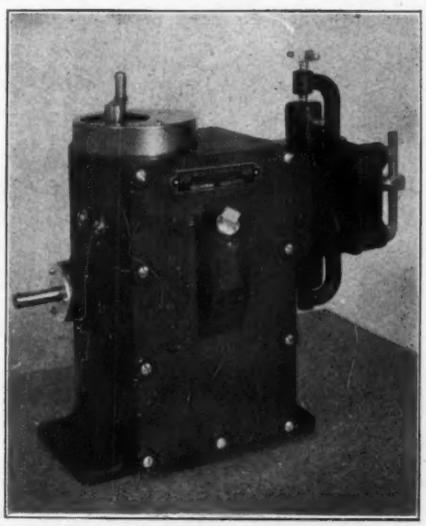
The substructure and tunnels of the South Side Filtration Plant, Chicago, were completed during the year. A program calling for bids for substantially all of the balance of the project was announced as follows:

September: Traveling cranes, landscaping of park fill and filter plant approach; tunnel connections to the existing distribution tunnel system. October: Superstructures for pumping station filter building and administration building, shore intake structure. November; Flocculators and sludge scrapers; December; Pumps and piping, structural steel for chemical building, miscellaneous iron filter equipment, superstructure for chemical building, chemical equipment; January: Electrical work, sludge disposal equipment.

Muskegon Heights, Michigan, laid a 4,620-ft. intake of 30-in. steel pipe, in 120-ft. lengths except for a few 60-ft. lengths near shore. The lengths of pipe were shipped on three freight cars, and were handled by two lifting lugs, 15 ft. each side of center to facilitate handling and to preserve the outside coating of the pipe from damage. Sand bags instead of wood blocking were used also to minimize coating damage. The pipe was jointed by mechanical joints and the use of a diver who directed the derrick signal man by telephone. It required an average of 5 hours per 120-ft. length for lowering and completely jointing and inspecting.



W & T's New Mobile Chlorinator for Emergency and General Service



W & T's New General Duty Hypochlorinator

America's Largest Water System in Operation

One June 18th there was put in operation the Colorado River Aqueduct System, 392 miles in length and the 100 m.g.d. softening and filtration plant of the Metropolitan Water District of Southern California. This is the largest single water system in America with an ultimate capacity of 1,000 m.g.d. The softening plant has an initial capacity of 100 m.g.d. and an ultimate capacity of 400 m.g.d. The aqueduct involved 18 years of engineering studies and planning, plus 8½ years of actual construction, during which time 38,000 men were at work. Los Angeles started studies and surveys in 1923. Actual construction started December, 1932.

Water is impounded by Boulder Dam. The District takes and pays for 36 per cent of the firm power gen-

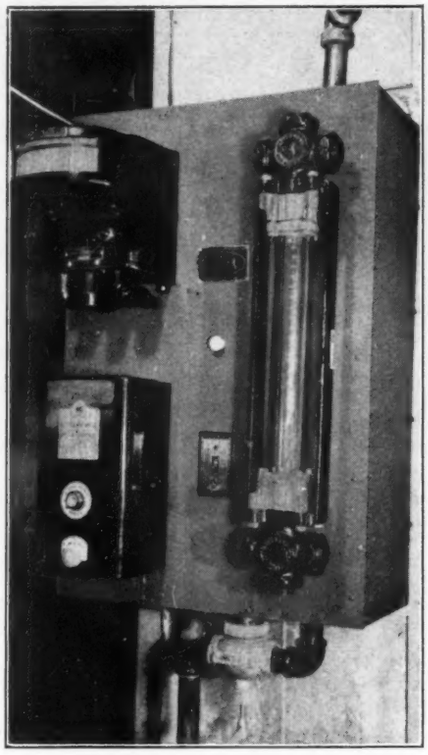
erated at the dam. The energy is used to operate five pumping plants which lift the aqueduct water a total height of 1,617 ft. across the mountains between the Colorado River and the Southern California Coastal Plain. Included in the aqueduct's distribution system are 150 miles of covered conduits, pipe lines and tunnels and three reservoirs. All the main aqueduct, with the exception of the pumping plants and a number of siphons, was built to full 1,000 m.g.d. capacity. The distribution system, initially, was built to half that capacity.

Water from the river 280 miles away is being treated at the softening plant, located at La Verne, before being distributed to Los Angeles and 12 other towns and cities of southern California constituting the District which was organized in 1928. The flocculators are 200 ft. by 50 ft. and the clarifiers, equipped with revolving sludge thickening and scraper mechanism, are 200 ft. square and 14 ft. deep. Raw water enters at a hardness of 300 p.p.m. and after treatment is about 90 p.p.m. The lime soda process plus zeolite softeners are used. The former reduces the hardness to 200 p.p.m. and the zeolite softeners do the remainder.

The bond issue voted for financing the project was $220,000,000. The work contemplated in the bond issue was completed for $22,000,000 less than the estimate. Water was delivered until August 18th without cost, during a two-month test period of the aqueduct distribution system. Since August 18th water is being sold to the various cities at 3½c per 100 cu. ft. The average retail domestic rate in the communities in the district is 14c per 100 cu. ft.

America's Largest Softening Plant in Operation

After a series of preliminary trials the lime treatment softening plant at Minneapolis was put into operation on June 10, 1941. The plant has a capacity of 120 m.g.d. and is the largest of its kind. It consists of 12 double cone precipitator units of the Spaulding type, each with a capacity of 10.0 m.g.d. and cost, with pumping and auxiliary facilities, $3,973,500. It required over four years to build. The basins are constructed of concrete and occupy an area 296 ft. by 378 ft. The plant is located on the Mississippi River near the Fridley filtration plant and is also interconnected with the City's other filter plant at Columbia Heights.



Compact Control Panel of the Under-Water Gas Burning Recarbonation System at Quincy, Ill.

Alongside but not pictured, is the compact Automatic Air-Gas Mixing Unit and Rotary Blower, which delivers correct air-gas mixture to the under-water burner.

Penna. Salt's Useful Portable Dissolving and Mixing Tank for Plant or Field Use

Usually the water is softened before going to the filter plants, but during periods of high color it goes first to the nearby Fridley coagulating basins where the color is brought down to 60 or 70 p.p.m. Water is then returned to the new plant for softening. The average hardness of the raw water in recent years has been 175 p.p.m. with normal fluctuations between 150 and 206 p.p.m. The new softening plant reduces this to 75 p.p.m.

The color for 23 years has ranged from 14 p.p.m. average minimum to 101 p.p.m. average maximum with a mean of 35 p.p.m. The finished water will have not more than 10 p.p.m.

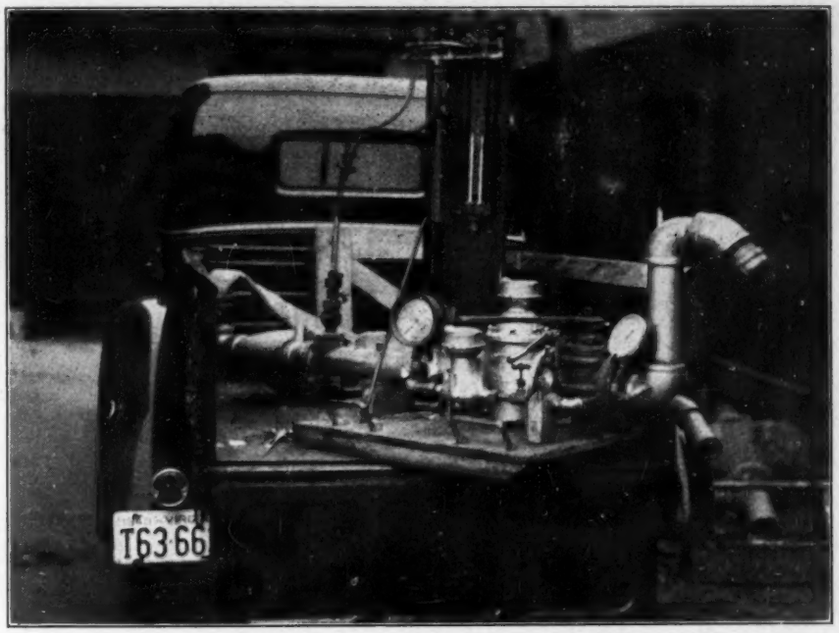
During the first two months of operation the pH of the raw water varied from 7.8 to 8.6 and that of the softened water from pH 9.5 to 10.0. The indications are that the costs of softening in the new plant will add about $8.50 per m.g. to the costs of filtering and such softening as was done by former methods.

On August 20th the new filter units of Atlanta's enlarged plant were put in operation. The additional units comprise one at 3.0 m.g.d. and six at 5.0 m.g.d., the latter being 44 ft. by 44 ft. in plan. The capacity of the completed plant is 54.0 m.g.d. of gravity type concrete filters and 18.0 m.g.d. of pressure filters, which are old and are used for reserve and peak loads. As a part of the project two sedimentation basins, each 417 ft. by 100 ft. were constructed in 1938. They have

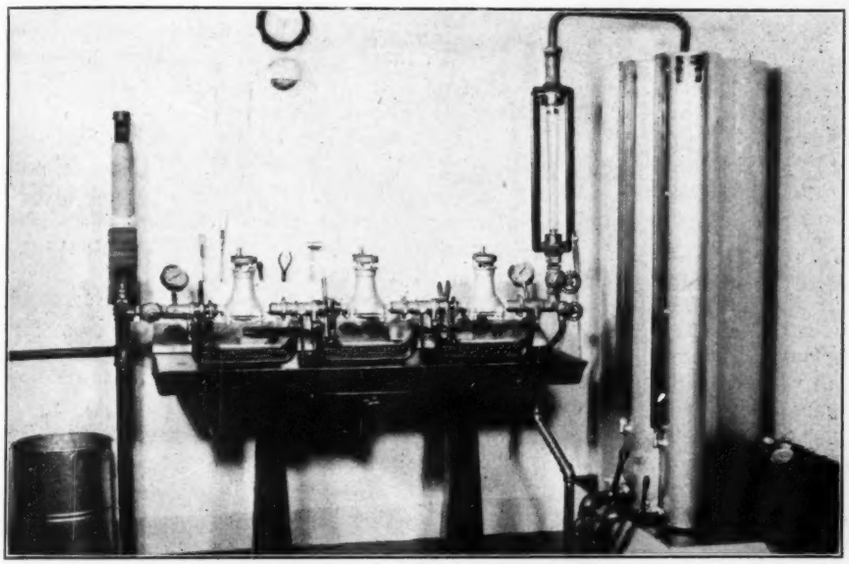
a capacity of 8,000,000 gallons and make a total settling basin capacity of 24.0 m. g.

Toledo, Ohio, dedicated its new water supply system on October 3rd. Water is taken from Lake Erie for this new supply. It is softer and easier to treat than that of the Maumee River, the lattler being subject to pollution from the cities and industries above Toledo. The principal elements of the project comprise the intake crib and conduit, low service pumping station, Lake Erie pipe line, filter plant and covered filtered water reservoir, high lift pumping station, elevated tank and trunk main across the city.

The construction costs were $8,761,777, plant sites and rights-of-way an additional $290,000 and the total cost, including engineering and testing, legal and administrative services, was $9,884,463.



Portable Unit for Making Accurate Tests of Large Meters in the Field
(Designed by D. R. Taylor, Roanoke, Va., Water Dept.)



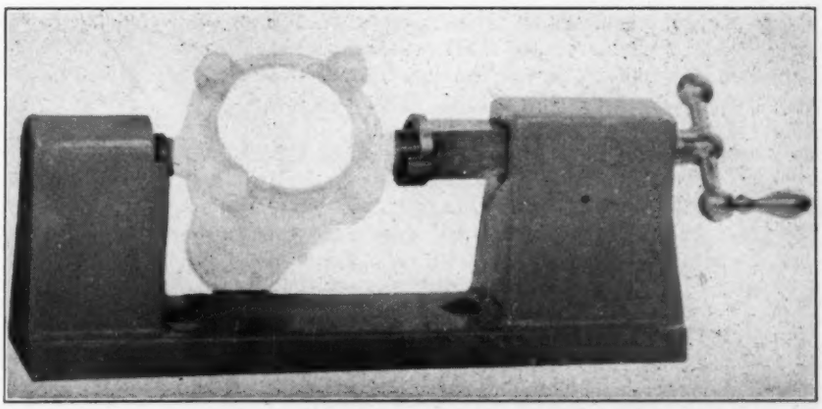
A Modern Three Unit Meter Testing Machine
The type that is going into the smaller meter shops, and denoting an increasing trend toward improved meterization practice. This one went into the new meter shop of Danvers, Mass.—See W.W.&S. for Sept. 1941.

New York's 85-Mile Water Tunnel

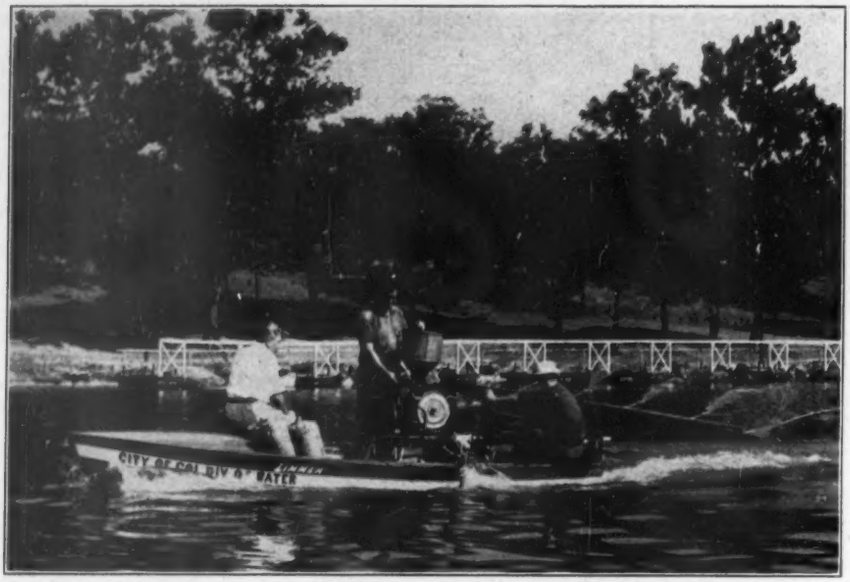
As of the middle of December the Delaware Aqueduct, being constructed by the board of Water Supply of the city of New York, had progressed to a point where the 85-mile tunnel was over 95 per cent excavated and approximately 75 per cent lined. The concrete core and cut-off wall at Merriman Dam has been completed. This dam forms the first of three reservoirs in which water will be collected in the Delaware System, which, upon completion, will furnish New York City with 540 m.g.d. of additional water. It is expected that the part of the tunnel between Kensico Reservoir and Hill View Distribution Reservoir in New York City will be put in trial operation in the spring of 1942 with the balance of the project going into service at intervals through 1946.

Weather

The weather extremes have been both violent and prolonged. During the first six months of the water year, October 1, 1940, to March, 1941, a deficiency in stream flow of great severity developed in the East Central States. The flow of five representative streams in Missouri, Illinois, Indiana, Ohio and Kentucky ranged from 10 to 22 per cent of normal for March. In two of such streams the low record for March was exceeded. The total runoff during the six months' period in an area of 280,000 square miles lying along or near the lower Ohio basin averaged 35 per cent of normal. In contrast, the southwest from Texas to California, experienced



A Highly Useful Meter-Vise
It won for its inventor, M. B. Cunningham, Oklahoma City's Supt., a prize from the Southwest Section of A.W.W.A.



The Coppering Boat of Columbus, Ohio

Patterned after the boat developed in the San Francisco Water Dept., it distributes a spray of copper sulphate solution.

particularly favorable water supply condition. By the end of the water year at September 30, 1941, the shortage had extended to include most of the Middle Atlantic and New England regions while the excessive stream low in the southwest continued. Stream flow in an area of 290,000 square miles east of the Mississippi centering about the Ohio River and extending through the Middle Atlantic region into New England averaged but 55 per cent of normal during the year.

The deficiency accumulated gradually during the year. At March 31st the average deficiency in runoff over the central area was 4.8 inches and by the end of September it was 8.0 inches. July was the only month during the entire water year in which there were no areas seriously below normal in the stream flow. Ground water levels in the East generally were below those of October, 1940, and many are at the lowest stage in nine years. The condition in New England was indicated by the record at Concord, N. H., where the rainfall during the period from January to September was the least in 89 years.

The Southwest, including the states from Texas to California, experienced stream flows ranging from 135 to 356 per cent of normal. Reservoirs reached all-time highs and ground water rose abnormally. In September heavy rainfall also extended northeastward through Oklahoma, Kansas, Iowa, Minnesota and Wisconsin. In October and November the situation became even worse in the critical areas. In an 18-state area covering 450,000 square miles from Maine to Georgia and extending west to Indiana and Tennessee, the stream flow was 39 per cent of normal in October and 50 per cent in November. Between the Mississippi River and the Rocky Mountains, on the other hand, record-breaking runoff conditions continued, reaching a peak in southeastern Kansas, with stream flow of 9,000 per cent of the October normal, which meant damaging floods. The relief in December in the east has been minor. New York's reservoirs at December 1st were but 35 per cent full compared with 44 per cent in 1939 and 48 per cent in 1930. The runoff into the New York City reservoirs has set a new low record. The average stream flow is 1,150 m.g.d. and the previous low average flow was 694 m.g.d. For the first eleven months of 1941 the stream flow has averaged but 598 m.g.d. Not until winter snows melt in the spring can many reservoirs begin to recover materially.

Purification and Treatment

It was decided some time ago that the "Treasury Department Drinking Water Standards," last revised in 1925, should again be reviewed. Early in March Surgeon General Thomas Parran of U. S. Public Health Service appointed an advisory committee to which suggestions of a sub-committee of Public Health Service were to be sent for consideration. Joseph W. Mountin, Asst. Surgeon General, Domestic Quarantine Division of U. S. Public Health Service, is Chairman. J. K. Hoskins, Chief of the Sanitation Section, Domestic Quarantine Division, U. S. Public Health Service, is Secretary. Other members are: Buswell, Illinois State Water Survey; Wolman, Johns Hopkins University; Gorman, Chicago; Cox, New York Dept. of Health; Junter, Food & Drug Administration; Weston, Mass., Dept. of Health; Sale, Food Division, Federal Security Agency; Bardwell, C. & O. Railroad; Goudey, Los Angeles; Buchanan, Iowa State College; Baity, University of North Carolina.

Discussions of a first draft of revised provisions, made public in June, took place at the Toronto Convention of American Water Works Association and at a number of section meetings. These suggestions included: A change in the size of water samples used for bacteriological examinations (from 10 milliliters to 100 ml.); examination of samples from points in the distribution system in addition to those now taken at the treatment plant; daily sampling of supplies when results indicate significant pollution; and higher permissible limits for copper and zinc.

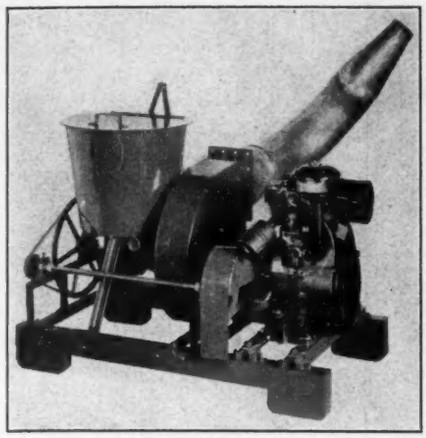
Late in December the special advisory committee was reported about ready to report final recommendations to the Surgeon General.

Chlorination

"Breakpoint" chlorination and super-chlorination of waters possessing no definite break point has received continued attention during 1941. Numerous applications of these processes have been made and there has been a general extension of the chlorine-ammonia treatment in other forms. A report by the Committee for the Study of Chlorine-Ammonia Treatment of Water was rendered at the Toronto Convention of American Water Works Association, which brought to date and in one place a valuable resume of the experiences and recommended practices. Among the notable experences described during the year were those at Wheeling, W. Va., and at the Charleston, Belle and Weston plants of the West Virginia Water Service Co. B. A. Poole of Indiana predicted in June that by January, 1942, half the filter plants in the state would be using "break-point" chlorination.

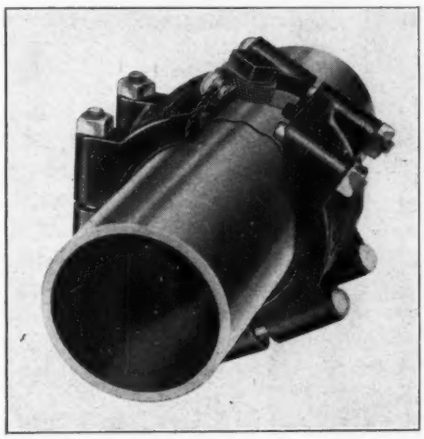
Stabilization and Corrosion Control

Calgon continues to extend the field of its use. A number of additional localities have reported the relief of red water troubles by its use, notably the new water system at Wichita, Kansas, and the Bristol, Conn., sys-



The Utility Spreader

For installation in a boat and broadcasting powdered copper sulphate, activated-carbon, or other dry chemicals over water areas. It was developed by the Utility Fan Corpn. of Los Angeles in cooperation with the Los Angeles Water Dept. which proved the value of the broadcasting method for coppering reservoirs.



The New Dresser Repair Sleeve

Uniquely designed in three sections to accommodate reasonable variations in pipe diameters and offset of broken ends.

Ingersoll-Rand Light Weight Utility Compressor

A one-man unit with many uses has 60 cfm. capacity at 100 lbs.

tem. Its ability to stabilize water following lime treatment was recognized in the new softening plant of the Southern California Metropolitan Water District, where it is used between the lime and zeolite treatments.

A year's successful use of the process of submerged burning of natural gas as a method for the recarbonation of water was reported from Oklahoma City and its adoption by Quincy, Ill., was announced. The advantages claimed for the process are greater chemical efficiency, simplified equipment, lower initial and maintenance costs, better control and non-corrosive effects from gas production and scrubbing. As practically no sulphur compounds are produced with the combustion of natural gas, it is unnecessary to use a washing process before liberating the CO_2 in the water.

New Equipment

Generally speaking, noteworthy items of new equipment that have become available during the year are in the nature of mobile emergency apparatus. Among these are a mobile chlorinator developed by Wallace and Tiernan. It is of the trailer type and mounted thereon is a chlorinator employing the vacuum principal, a 5 HP. gasoline engine and a self-priming pump which will deliver the required injector water at sufficient pressure to apply 100 lbs. of chlorine per day against a maximum pressure of 100 psi in the main. Also cradled on the trailer are two 150-lb. chlorine cylinders. The outfit includes a complete set of accessories for emergency connection to mains and a comparator for making residual tests which has a self-contained light source for night use. The gross weight of the outfit including the chlorine cylinders is 2,150 lbs.

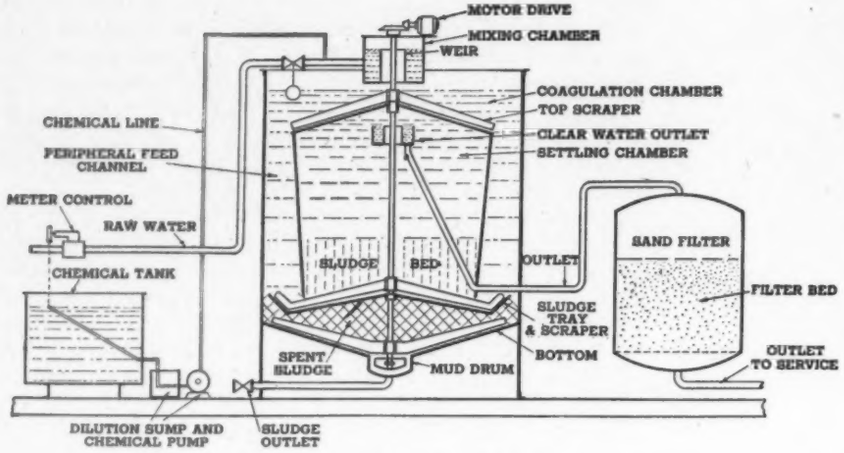
Also brought out by Wallace and Tiernan is a belt-driven hypochlorinator for use in army camps or construction jobs. It is adaptable where water is pumped by gasoline engine or where there is a drive shaft or power pulley available. The unit will pump 60 gallons of solution in 24 hours against back pressure of 30 psi. It can be used for pumping all water treatment chemicals.

Ingersoll-Rand has developed and marketed a 60 cu. ft. compressor, engine driven, mounted on two wheels and so balanced that it can be pushed about by one man. It also comes on a skid and on a four-wheeled mounting for high speed towing. It is useful for driving air tools in pipe laying, blowing water from mains and cleaning out service lines.

Proportioneers introduced a new "Chem-o-feeder." It is a small, compact unit for feeding all chemicals used for water treatment and conditioning of water. It provides, for portable emergency operating in one unit, for sterilization, pH control, coagulation chemical feed and corrosion prevention. The unit has a capacity of 10 g.p.h. of solution.

A small water purification unit is now available which adds chlorine, alum, soda and lime as required. Water, so dosed, is forced through a highly efficient filter. The outfit has a capacity of from 10 to 100 g.p.m. It is mounted on skid, trailer or truck. It is made by American Water Softener Company, Philadelphia.

A mobile Ozone water purification plant, designed for army camps for use on maneuvers, was brought out by Technicraft Engineering Co. of Los Angeles. It has a gasoline engine driven, 10 KVA., 220 volt, 3 phase generator. A 5 HP. motor drives the treated water and raw water pumps on opposite ends of the motor. This motor also drives, by V belts, a compres-



The "Reactivator"—a Graver Product of 1941

Provides automatic chemical proportioning and upward flow sludge blanket clarification.

sor, cooling water pump and evaporative cooler. Ozone is generated by the electric discharge between aluminum plates at 13,000 volts, furnished by a 2 KVA. transformer. Single units, truck mounted, have a capacity of 150 g.p.m.

Dresser brought out a pipe repair sleeve for breaks in cast iron pipe. It has three sections, each with two rubber compound end gaskets and one side gasket. The sections are held together by six bolts. It is adjustable through a considerable range of sizes and will handle an offset of as much as 5/8 inch.

The seriousness of surge and water hammer is being more generally recognized by water works operators. Increasing interest is manifest in devices to minimize the effect of rapidly closed valves or quick shut-downs of centrifugal pumps attached to long lines. Available and being used more frequently with centrifugal pumps are special relief valves with surge suppressors mounted on and operating in conjunction therewith as manufactured by S. Morgan Smith and Pelton. Such a device opens first with a drop in pressure following the pump shut-down so that the valve is already in operation and dissipating energy before the surge wave returns. As the pressure rises the valve, instead of closing, is again opened as the pressure becomes abnormal. The damping effect of relief during both the periods of subnormal and abnormal pressures quickly quiets the surge and with less wide swings of pressure.

Syracuse, San Francisco, Los Angeles and Columbus, Ohio, reported the successful use of devices to spray copper sulfate in reservoirs for algae control. Both Syracuse and San Francisco use a solution which is distributed as a fine spray through nozzles. Los Angeles uses a device which blows dry copper sulfate under regulated speed and direction. The first two devices were developed by the respective departments whereas the dry blower is marketed by the Utility Fan Corporation of Los Angeles.

An improved model of the Enslow Stability Indicator which has proved useful in controlling anti-corrosion treatment and water softening has been developed by Phipps and Bird, Inc., of Richmond, Va.

Just at the time it began to be difficult to get copper tubing and brass pipe for service lines, the American Smelting and Refining Co. came forward with a new tubing for water lines and consumer services. The product, trade-named "Tube-Loy," possesses characteristics of both lead pipe and copper tubing. It is produced in two types —Type "A," for use where lead pipe has heretofore been employed; Type "K" for use where copper tubing has been or would be employed. Tube-Loy is an alloyed lead product (containing tin and small particles of calcium and magnesium) which possess greater strength than good grade lead, a lower rate of creep and greater ductility, while retaining all of the corrosive resistant qualities of pure lead and the strength of copper tubing.

The city of New York, long a user of lead service pipe, undertook tests of Tube-Loy covering ductility, strength and tendency to go into solution. As a result of such tests New York's regulations covering material to be used for water service lines was amended to include Tube-Loy. The material has been adopted by many cities and water companies. In one year, because of the priority situation, it has attained a volume of use comparable to what might ordinarily be achieved only in many years.

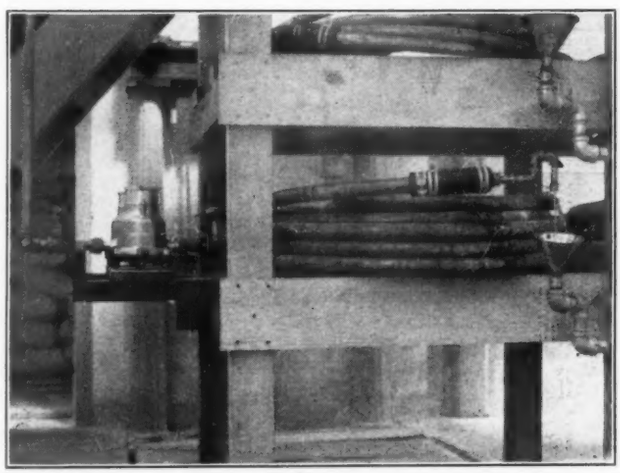
Even more recently The Dow Co. of Midland, Michigan, has announced a plastic tubing of qualities to compete with copper tubing. It is jointed in the same manner as is copper tubing.

Miscellaneous

A number of interesting and, in some cases, unique occurrences have taken place during 1941, the more noteworthy of which follow:

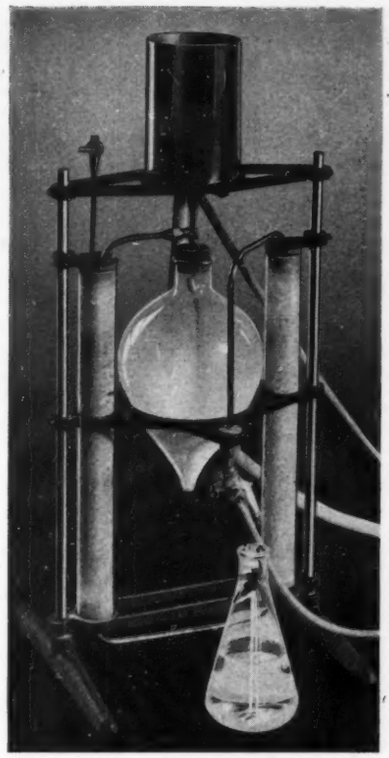
In the middle of June, FWA set up an organization through which to work with state and local agencies in the formulation of public works programs in order to have available billions of dollars worth of public works all designed and ready to build to take up slack after defense work drops off—the Public Works Reserve.

Late in July, FWA Administrator Carmody appointed 35 state directors. They will direct cooperative efforts in 39 states among local, county, state and federal officials. First step of PWR in undertaking this work is an inventory of immediate and future needs of vil-



The New "Tubeloy" Tubing

Introduced by Am. Smelting & Refining as a substitute for copper and lead service tubing, is an alloy of calcium and lead.



The Improved Enslow Stability Indicator
(Announced by Phipps & Bird, Inc.)

lages, towns, cities, communities and states for the next six years. Preliminary estimates indicated a total of 25 to 30 billions in a six-year program. With the uncertainties of war the question of when such a six-year period will begin is, of course, moot.

Army Camp Systems

Of particular interest to water works men in army camp construction is the standard of design set out by the Construction Division, of the Office of Quartermaster General. The basic design data called for provisions for an average daily water consumption of 100 gallons per capita, a peak consumption of 250 gallons per capita per day and capacity to handle 2 concurrent fires at 1,000 g.p.m. each with a residual of 30 psi using C = 100. Local storage is suggested in an amount equal to one-half the daily average consumption.

Experience for seven months in 1941 at Camp Edwards on Cape Cod in Massachusetts, reported by Ellsworth of Boston, shows an average daily consumption, excluding Saturdays and Sundays, of 94 g.c.d. The peak use, between 6:30 and 7:30 a. m., was at 196 g.c.d.

U. S. Pipe & Foundry Co., late in September, lighted a reconditioned blast furnace at Riddlesburg, Pa., which had been shut down for several years. The plant, together with supplementary coal mine and coke ovens, was leased from RFC to produce pig iron for the company's foundry at Burlington. Production is estimated at 6,000 tons per month.

Cathodic Tank Protection

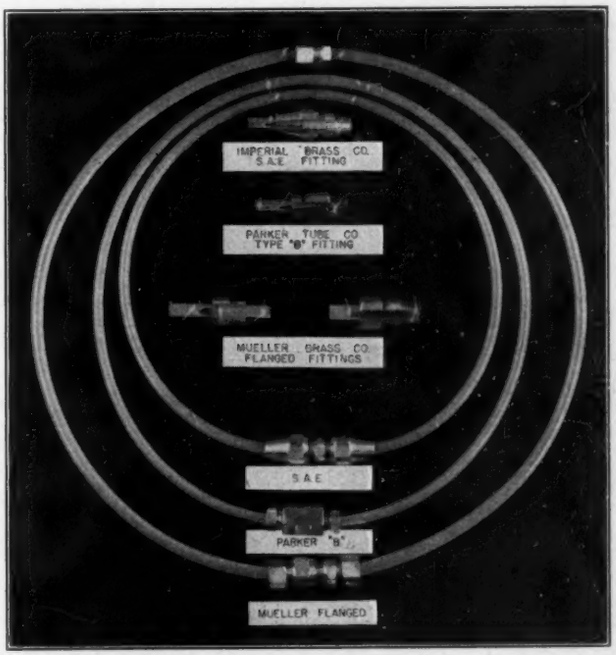
Cathodic protection of water tanks and standpipes continues to be specified in many new installations. Available data indicates that approximately 900 tanks now have this protection. Operating experiences are not consistent, though generally reported satisfactory. There continues to be considerable disagreement as to the best material for anodes. Some prefer special steel, another carbon or graphite, another cylinders of spun glass filled with coke breeze. The most common cause of trouble is from ice pushing the anodes out of place. This is being met in several more recent installations by the use of anodes attached to the outside of the tank. The solution in most cases of ice troubles has been to remove the hanging electrodes from the tank for the period of ice formation, during which corrosion is subdued by the low temperatures.

In early April, Miami sold $7,633,000 of water revenue bonds to buy the distribution system of the Miami Water Company for $4,500,000, to pay claims in connection with hydrant service, street railways operation and street lighting and to expand the water distribution system. The city had owned the source of supply and purification plant and had sold water to the privately owned water company for distribution through its system for a number of years. It is expected that the Water Department will now pay $200,000 annually to the city for bond retirement, besides paying taxes of $50,000. The city in turn will pay the department $30 per year per hydrant for fire service.

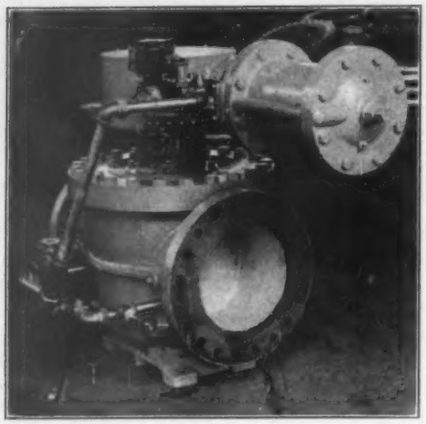
Sewage Plant Effluent as Industrial Water

On July 9th an agreement was signed whereby the Bethlehem Steel Co. plant at Sparrows Point, Md., will purchase up to 40.0 m.g.d. of treated sewage effluent from the city of Baltimore disposal works, for use in steel processing operations. Static water of the company's wells had fallen 100 ft. and the water had become contaminated with salt water intrusions. More water was needed for defense needs, so this procedure of using treated sewage as industrial water has been resorted to as has been done elsewhere, notably in Kansas, where a railroad uses sewage effluent, and also at Corpus Christi, Texas, where an oil refinery uses the effluent. Bethlehem Steel Co. will spend $2,000,000 in constructing four miles of 48-in. pipe line and a treatment plant for further special treatment of the effluent water by chemical percipitation methods.

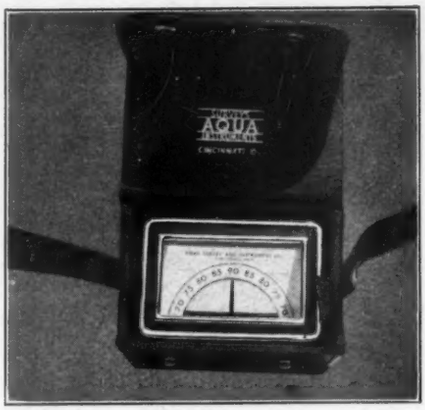
The agreement states that (1) pH will be between



Saran Plastic Tubing
Introduced by the Dow Chemical Co. as a substitute for hard to get copper tubing.



New Synchronized "Rotovalve" for Surge Prevention
(Introduced by S. Morgan Smith)



A New Valve Box Locator
(Introduced by Aqua Survey Instrument Co.)

6.5 and 7.8. (2) Total suspended solids shall not exceed an instantaneous maximum of 50 p..p.m. and the monthly average shall not exceed 25 p.p.m. (3) The 5-day biochemical oxygen demand shall not exceed an instantaneous maximum of 45 p.p.m. and the monthly average shall not be over 25 p.p.m. (4) The chloride content shall not exceed 170 p.p.m.

For less than 25.0 m.g.d average rate of use, the charge is $1,000 per month. When the average use is between 25.0 and 37.5 m.g.d., the rate is $1,500 per month and for an average consumption of over 37.5 m.g.d. up to 40.0 m.g.d, the rate charged is $2,000 per month.

First Operator's Tenure Act

An important milestone in management and operation was the passing in June, 1941, of New Jersey's Water and Sewage Tenure Act. By this act water and sewage works operators in responsible charge are now protected agianst loss of their jobs or pay reduction of consequence (which latter was often a method of forcing them out where straight-out discharge was impracticable), because of political change or any cause other than inefficiency or dereliction in discharge of duties. A hearing must be granted at which charges must be proved. It is applicable to operators after five years' service. The first law of its kind, it required concentrated efforts over a period of years to obtain its passage and should make the next one in some other state easier.

Necessity to Be "Mother of Contrivance" in '42

The coming of war in December has changed the situation faced by all men engaged in the business of furnishing water service, with all its ramifications, largely in the direction of intensity. Demands for water service to plants engaged in the manufacture of arms, ammunition and other implements of war and to the enlarged communities where such plants are located, are going to be increased still further. The tempo must be stepped up in the face of further difficulties in getting the materials and equipment usually employed. The ability of the water superintendent and engineer as a "contriver" will, in the days ahead, be tested as never before.

A KINK FOR CHECKING MATERIALS

Here is an ingenious and simple method for keeping a record of pipe fittings. This writer has never seen anything like it before. It was developed by an engineer friend of mine who is with a large eastern engineering company.

REDUCING TEES.								RETURN BEND
NO.								1"x2½"
H								1"x3"
								1¼"x3"
								1¼"x4"
REDUCING ELBOWS								BUSHINGS
NO.								¼"x
90° C								¼"x
								½"x

*Contributed by W. F. Schaphorst (M.E.), Newark, N. J.

For example, where reducing tees have three different sizes of openings, as often happens, the problem of recording those openings in an orderly manner has heretofore always been a "sticker." The accompanying reproduction of a blank used by this engineering concern shows how easily it can be done.

Similarly, reducing elbows and return bends can be checked or recorded on the same blank. The blank, therefore, tells the whole story without the necessity of vexing explanatory remarks, such as are to be found attached to the usual variety of records pertaining to fittings of this character.

THE SLUDGE TRIANGLE:

Key to a Rapid Method for Determining Sludge Solids

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BUFFALO SEWER AUTHORITY
BUFFALO, NEW YORK

OPERATORS of sewage treatment plants often desire to determine the concentration of solids in sludge quickly and relatively accurately. This is particularly true in the operation of sludge dewatering processes for either raw or digested sludge.[1] Early attempts to develop rapid determinations have included filtration in aluminum dishes,[2] determination of specific gravity[2] and the determination of the volume of solids after centifuging.[3] None of these methods fully meet the desired requisites as to combined speed and accuracy. Following the development of the importance and effect of the volatile matter content of sludge on the specific gravity and the volume of solids after centrifuging,[3] experiments were begun in the Bird Island Laboratory on the method proposed herein. The result of this study has been the development of a technique for determining sludge solids from the volume of filtrate liquor obtained by filtering a chemically treated sample. It has been possible to develop a graphic relation between filtrate volume, per cent solids, per cent volatile matter and specific gravity. The development of these relations is the basis of this report.

Preliminary Considerations and Experiments

Before developing the technique to be employed in this study, consideration was given to previous work of the investigators and the theoretical implications of the work as they might be applied to the current problem. These theoretical considerations, together with deductions, are outlined in the following steps.

(1) Drainability or filterability of sewage sludges is a function of the extent of digestion of the sludge.[4, 5, 6] Likewise, the rate at which water may be expressed from sludge under pressure appears to bear some relation to the ripeness (extent of digestion) of the sludge.[7, 8] Whether the rate of release is a function of "bound water" (i.e., colloidal water-binding properties of the sludge[7] or of the mechanical operation of gels under pressure (i.e., dependent on properties of viscous flow and agglomeration of particles)[8] is of no importance in this study. The important indication of these observations is that the volatile matter content of the sludge has some relation to the release of water, although the relation may not be a direct one.

(2) The volatile matter of sludge has been shown in this laboratory[3] to affect the volume of sludge when centifuged. It was observed that the equation representing the relation of volatile matter content to volume of centifuged solids depended on whether the sludge was raw or digested. This indicates that the effect of volatile matter on particle size of the sludge (i.e. specific volume and specific gravity) is dependent on some colloidal property other than "bound water," and may vary with the type of sludge. The effect does exist although it may not be a direct relation.

(3) Although Althausen[8] in his experiments to determine the release of water from sludges using pressure in a Carver laboratory press, did not relate the volume of water retained in the pressed sludge cake to the amount of solids in the cake, he did point out that the retained water occupied approximately 25 per cent of the volume of the cake and that this "closely corresponds to the volume of the voids in packing of spheres." From considerations of the physical relationship of the volume of the solids particles to the volume of the sludge sample, it is apparent that the volume of the particles plus the volume of liquid (water) equals the volume of the sample. Upon expression of the liquid from the sludge by pressure, the following relations exist:

$$V_s = V_p + V_r + V_e \quad \text{....(Eq. 1)}$$

Where V_s = Vol. of sample of sludge
V_p = Vol. of sludge particles
V_r = Vol. of water retained in sludge cake
V_e = Vol. of water expressed

(4) From the theory of packing of spheres the volume of liquid retained bears a relation to the volume of the particles themselves. For any particles of particular specific gravity therefore, the volume of water retained in the cake must bear some relation to the concentration of solids in the original sample, inasmuch as concentration (per cent solids) is a function of the mass of the solids and mass of the original sample.

(5) The mass of the original sample may be determined by weighing the sample or by measuring the volume and determining the specific gravity of the sample. Hence, it appears that if the volume and specific gravity of a sample are known, and the volume of water retained in the pressed cake is determined, then the per cent solids in the original sample may be calculated either by formula or graphic analysis of curves developed to show this relation. This relation may be expressed as follows:

$$\frac{(V_s \times Sp.G._{(s)} - V_e)\, f}{V_s \times Sp.G._{(s)}} = \%\ \text{solids} \qquad \text{(Eq. 2)}$$

Where f = empirical factor derived from experiment. In other words, it is the ratio of mass of sludge particles to the mass of wet cake, and is dependent on specific volume or specific gravity of the particle.

(6) Inasmuch as work on the relation of centrifuged volume of solids and volatile matter content,[3] indicated that the specific volume or specific gravity of sludge particles is dependent on the volatile matter content, it is evident that the water retained in a dewatered sludge cake should vary, not only with the concentration of the solids, but also with the volatile matter content.

(7) Thus, from the foregoing considerations, of these inter-relations of Spec. Grav., volatile matter, volume of sludge particles and liquids, it appeared that some technique for rapidly determining the water held in a sludge cake, would offer a means for rapidly estimating the solids concentration in sludges. This study was undertaken to develop these inter-relations.

As Mohlman[9] has indicated the "technique proposed by Althausen and Buswell is not so simple" besides requiring expensive equipment, and although he referred to the use of presses to determine filterability of

[1]Chief Chemist, and [2]Assistant Chemist.

sludge, the criticism applies equally well to the use of presses for the development of a quick test for sludge concentrations. One alternative seemed to be an application of the well-known Buchner funnel test inasmuch as, in effect, this is an expression of liquid by differential pressures. Vacuum filtration of sludge is slow unless electrolytes are added and the pH changed for the purpose of disturbing the colloid-water equilibrium[10] of for affecting the aggregation or agglomeration of solid particles.[8] The necessity of introducing electrolytes to assist filtration or removal of water pointed to the fact that use of this technique meant development of an empirical test. In the development of the test, other empirical factors had to be ascertained and standardized.

Lime and ferric chloride were chosen as the electrolytes for increasing "drainability," and work on the method proceeded with preliminary experiments developing a relation between volatile matter content and specific gravity; also between volatile matter content and water retained in the cake. On plotting these preliminary experiments, it was found that a curve representing volatile matter plotted against water retained had a slope opposite to the curve representing volatile matter plotted against specific gravity, for any particular sludge solids content. Thus it became evident that if specific gravity were plotted against water retained in the cake, it would be possible to obtain from such a graph, both total solids concentration and volatile matter content of the sludge sample.

It was also observed that for a curve representing volatile matter plotted against volume of centifuge solids, the slope was similar to that of volatile matter plotted against water retained. Thus, when specific gravity was plotted against the centrifuged solids volume, it was possible to obtain a graph from which both total solids and per cent volatile matter could be determined.

From Equation 1, it is readily observable that the liquid retained in the cake is the difference between the original volume of liquid in the sample and that expressed by filtration. Rather than determine the quantity of water retained by drying the cake, it appeared that the simplest means of quickly finding the quantity was to determine the volume of filtrate liquor and relate that to the volume retained by formulæ developed mathematically and experimentally. Experimentation, therefore, proceeded along the lines indicated in the preliminary experiments, observations and considerations.

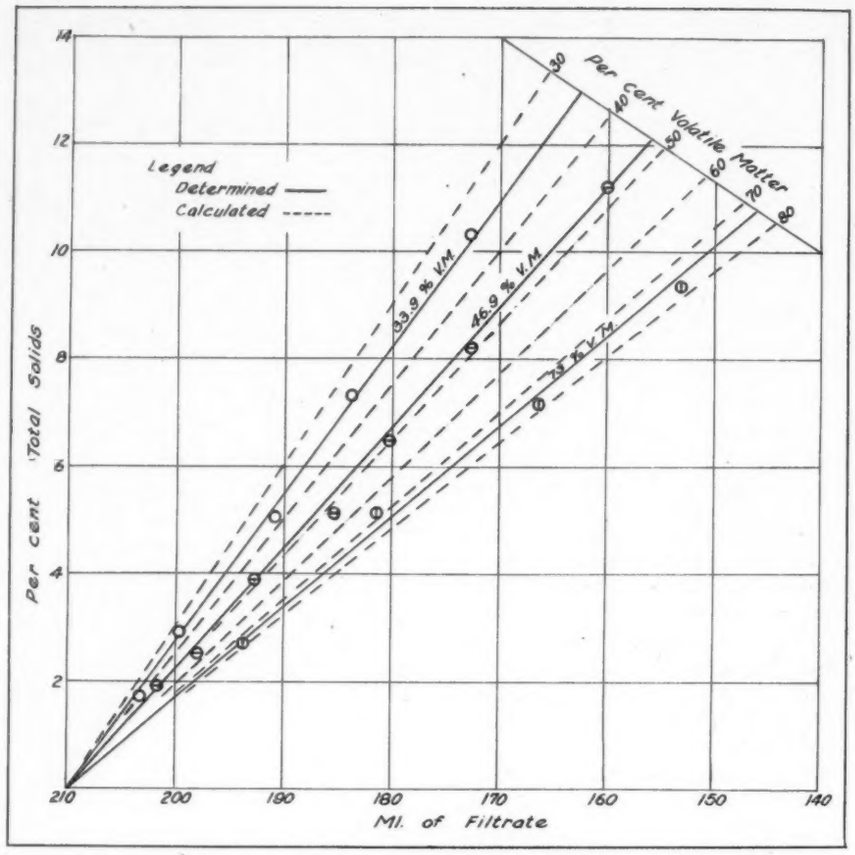

Fig. 1—Relationship of Filtrate Volume to Solids Content of Various Sludges

Experimental Techniques

In order to aid in simplifying the test, the technique developed was a variation of the Buchner funnel method,[11, 12] for determining sludge conditioning dosages. However, in the early experiments it was found advantageous to insert an aluminum dish[2] with perforated bottom in the Buchner funnel to catch the solids. The cake so collected could be easily dried and weighed with the dish. Whether the Buchner funnel or the dish was employed, 200 ml. of sample could be used and the sampling error reduced. Weighing of the dried cake gave a value for sludge solids in the original sample, but this value did not include dissolved solids in the filtrate liquor. A correction for this empirical factor was omitted inasmuch as the error involved was negligible for practical purposes.

Inasmuch as the method involved the addition of chemicals and the subsequent removal of water from the solids, a correction factor for water retained by the chemicals as well as the volume of the liquid in the reagent had to receive consideration as empirical factors. Considerations were also given to the amount of chemicals to be added (both concentration and volume). Reagents were made so that the milk of lime contained 0.1 gram of available lime (CaO) per ml. and the ferric chloride solution contained 0.1 gram of $FeCl_3$ per ml. The volumes of reagents adopted for the test were 10 ml. for lime and 5 ml. for ferric chloride. These volumes appeared to disturb the water-binding property and produce a rapidly filtering sludge (either raw or digested), regardless of the original content of solids, volatile matter, pH or alkalinity.

The addition of chemicals to the sludge introduces three empirical factors. First, the solid cake produced by the chemicals adds to the weight of the dry solids in the cake; therefore any experimental determinations to ascertain the per cent solids in the original sludge sample had to be corrected for the weight of the "chemical cake." Secondly, this chemical cake adds to the bulk of the cake on the filter and, consequently, to the voids in the cake, thus retaining an additional quantity of water. Thirdly, the liquid volume of chemical reagents used adds to the volume of the filtrate liquor. A blank reading was made on filtering the chemicals alone; the quantity of chemical cake produced was determined, as was its water containing

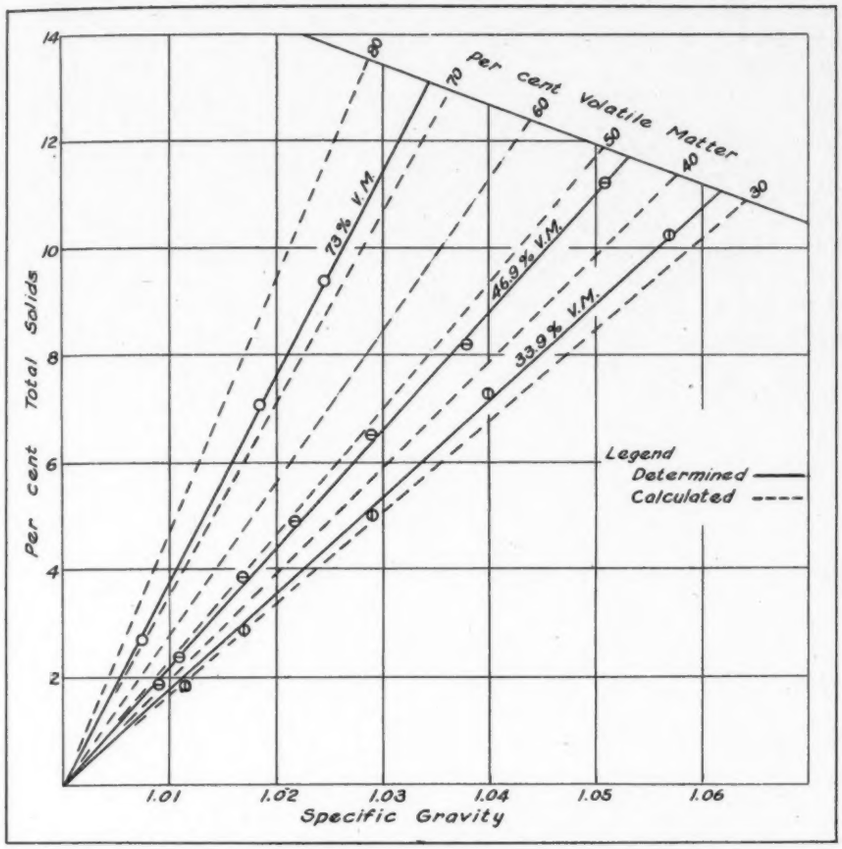

Fig. 2—Relationship of Specific Gravity to Solids Content of Various Sludges

capacity. The development of the test took into account the blank weight of chemicals and the volume of liquid retained by the chemical cake alone, as well as the volume of filtrate liquid for the chemical reagents. The latter factor, in effect, drops out of consideration since it is included in the recorded filtrate volume.

In the interest of obtaining sufficient data on which to base conclusions, it was necessary that tests and experiments be made on sludges of different solid and different volatile matter content. To obtain sludges having the same volatile matter content, but varying solids concentrations, the following methods were used:

Sludge solids concentration was increased by partial centrifuging and decantation of some of the supernatant liquor; to obtain sludges of lower solids concentration, the heavy sludge obtained by centrifuging was diluted with supernatant liquor from centrifuged sludges. This use of supernatant liquor for dilution minimized errors due to changes in specific gravity, pH, alkalinity, and colloid equilibrium, all of which would have been disturbed to a greater degree by the use of water for dilution. Both raw and digested sludge of various volatile matter contents were obtained from normal plant samples. For digested sludge of extremely low volatile matter content, a sample of tank sludge from the Buffalo plant was subjected to further digestion in the laboratory until the volatile content had reached the point desired.

Another empirical factor considered, was the volume of water which would be retained on the sides of the beaker in which the sludge was mixed before pouring onto the filter. It was found that the correction for this could be made by rinsing the beaker with water, draining and using without drying. The volume of water held in the voids of the sludge cake depends on the volume of these voids, and to reduce these voids to a minimum requires pressures[7, 8] much higher than obtained by vacuum filtration. In order to utilize the full effect of pressure producible by vacuum, cracks in the cake were removed by pressing with a flat mushroom stopper. This empirical factor was standardized as described later.

In special cases, it was found that certain variations in technique could be employed; for example, when the solid concentration was above 8 or 10 per cent, and a sample of sludge would not pour cleanly from a graduate in which it was measured, the graduate could be rinsed out with 20 ml. of water from a pipette and the rinse water poured into the beaker containing the sludge to be conditioned and filtered. After the filtration, 20 ml. was subtracted from the volume of the filtrate readings in order to give the filtrate volume from the original sludge.

Where greater accuracy of measurements is desired it is possible to weigh the original sample of sludge and then weigh the graduate or beaker from which it is poured into the Buchner funnel. This difference in weight when corrected for specific gravity will give the actual volume of sludge conditioned and filtered. Since the test depends upon the use of a standard 200 ml. sample, any variation from that volume, as determined by difference in weight, according to this method, can be applied to the filtrate volume reading in order to produce a correct reading.

For the determination of specific gravity in these experiments, a 500 ml. Erlenmeyer flask was used to reduce the error attendant with smaller samples. Into the neck of the Erlenmeyer flask was fitted a No. 8 one hole rubber stopper (fitted with a 1½ inch length of glass tubing) which was cut down in size in its lower half to fit the Erlenmeyer flask and left in its natural size in the upper half to form a tight fitting collar when inserted. This apparatus resembles a Gay-Lussac unadjusted specific gravity bottle and was used as such. All weighings were made on a laboratory torsion balance, to the nearest 0.5 gram.

To determine the specific gravity, a well mixed sample of sludge was poured into the tarred Erlenmeyer flask and the stopper put in place, excess sludge being forced out through the glass tubing. The outside of the flask was rinsed. With a finger held over the opening in the glass tubing, the Erlenmeyer flask was shaken in a vertical plane; the upward motion was rapid to increase the effect of gravitational force while the downward motion was slow. This technique caused small air bubbles, entrapped in the sludge, to rise to the top. After shaking 50 times in this manner, the stopper was removed and sludge added to the flask until full; the plug was replaced in the flask and excess sludge forced out. The Erlenmeyer flask was then washed, wiped on the outside and weighed. The weight of the sludge divided by the weight of the same volume of water gave the specific gravity.

For sludges of greater than 8 per cent solids, the gravity can be de-

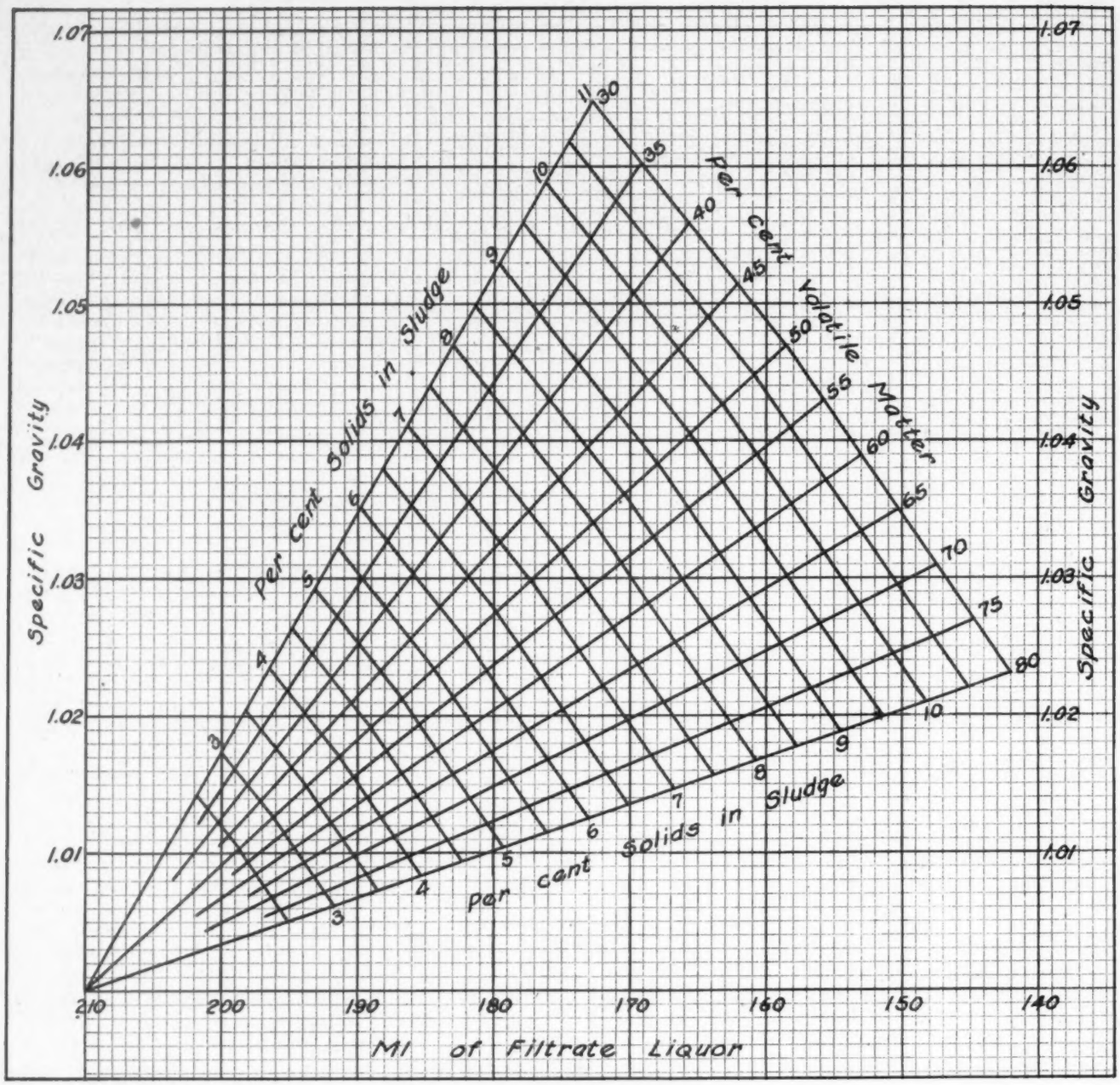

Fig. 3—The Sludge Triangle

(A Graph of Interrelations of Three Sludge Characteristics)

termined by diluting the sample with an equal volume of water. This procedure simplifies the removal of entrained air bubbles. In this case the specific gravity of the original sludge is calculated according to the equation: $(Sp.G - 1) \times 2 + 1 = Sp.G.$ of the original sludge. This technique will eliminate some of the objections to the determination of specific gravity mentioned by Smith.[2]

The Rapid Method

Measure 200 ml. of well-mixed sludge in a 200 ml. graduate (calibrated to deliver 200 ml. volume of water). Pour the sludge into a 400 ml. beaker that has been rinsed with water and drained, but not dried.

Add 10 ml. of lime reagent containing 0.1 gram of available CaO per ml. Mix well with a flat policeman; add 5 ml. of ferric chloride reagent containing 0.1 gram of $FeCl_3$ per ml. Mix again.

Place a No. 615 crepe surface filter paper, or equal, on 3½ inch Buchner funnel, and insert the funnel in a 500 ml. filtering flask. Wet the filter paper with water, apply vacuum until the free liquid has been removed from the funnel, then empty the filter flask.

Pour the conditioned sludge into the Buchner funnel, removing with a flat rubber policeman, drops of the sludge sample adhering to the walls of the beaker.

Apply the vacuum to the flask and when the break through of air is noted, carefully press the surface of the filter cake with the flat top of a mushroom stopper, or other flat object, to close cracks in the cake and thereby allow full effect of the vacuum. Continue the vacuum and the pressing of the cake until the liquor, passing through the Buchner funnel does so at a rate of less than 1 drop every five seconds. Continued vacuum beyond this point may produce an evaporation of liquid sufficient to interfere with the accuracy of the test.

Pour the filtrate from the vacuum filter flask into a 200 ml. graduate (preferably the same as used in measuring the original sludge), and observe the volume of the filtrate liquor.

If the volatile content of the sludge is not known, determine the specific gravity of the sludge by the method already described. From the specific gravity and the volume of the filtrate liquor, the per cent solids in the original sludge sample and the per cent volatile matter in the sludge may be determined from the graph developed for that purpose. If the volatile content of the sludge is known or approximately known, it may be unessential to determine the specific gravity in order to obtain the approximate concentration of solids in the sludge.

Experimental Results

Using the method outlined above, determinations were made of the filtrate volume from a number of different sludges. These sludges fell into three groups as regards the volatile matter content. Inasmuch as the several different samples in each group were of relatively the same volatile content, observations on sludges in these different groups were averaged. The data shown in Table I, for three different sludges of 33.9 per cent V.M., 46.9 per cent V.M., and 73.0 per cent V.M., represent average results on a number of sludges in each of the groups. The volatile matter content of the group is likewise an average of the several samples in each group. In each group of sludges represented by different volatile matter contents, tests were run on samples of different total solids content. The summary of all of these observations is shown in Table I. (The solids content does not include dissolved solids in the sludge liquor, but this factor is small and was ignored.)

The first step in determining the inter-relation of these data was to plot the volume of filtrate liquor against solids concentration for the three groups of different volatile matter content. When the lines representing these three groups are extended, they pass through the point of 210 ml. of filtrate liquor for a zero solids content sludge. This volume is that obtained as a blank reading for chemicals alone.

From the location and slope of these curves, similar curves were located graphically for sludges of volatile contents ranging from 30 to 80 per cent, in 5 per cent increments. Thus it was possible to read, from the graph, the relation of filtrate liquor to solids concentration for sludges of various volatile matter content.

Table I

Average Results of Observations on the Relation of Filtrate Volume to Total Solid and Volatile Matter Content of Sludges.

GROUP A Avg. Vol. Mat. Content 33.9%			GROUP B Avg. Vol. Mat. Content 46.9%			GROUP C Avg. Vol. Mat. Content 73.0%		
Susp. Solids (%)	Filtrate (ml.)	Sp. Gr. of Sample	Susp. Solids (%)	Filtrate (ml.)	Sp. Gr. of Sample	Susp. Solids (%)	Filtrate (ml.)	Sp. Gr. of Sample
10.3	172.5	1.057	11.2	160.	1.051	9.4	153	1.0245
7.3	183.5	1.040	8.2	172.5	1.038	7.1	166	1.0185
5.0	190.5	1.029	6.5	180.0	1.029	5.2	181	1.0140
2.9	199.5	1.017	4.9	185.1	1.022	2.7	193.5	1.0075
1.7	203.0	1.012	3.9	192.5	1.017	..	....	.....
..	....	....	2.4	197.8	1.010	..	....	.....
..	....	....	1.9	201.5	1.009	..	....	.....

The data in Fig. 1 show definitely that the removable water is a function of the solids present. The extent to which this water may be removed from a sludge of given solid content is dependent on, and varies inversely, with the volatile matter content of the sludge. If this were not true, the three curves would be superimposed. Whereas one curve for all sludges might be considered as an advantage in simplification, the actual conditions have an advantage as will be developed in a later section of the paper.

The second step in developing the application of these data was to plot total solids against specific gravity readings for the three average sludges of different volatile matter content. These plots are shown in Fig. 2. As with the data in Fig. 1, other curves were graphically located to show the relation of specific gravity to solids content of sludges of varying volatile matter content. It was noted from Fig. 2 that the extended lines pass through a point of 1.200 Spec. Grav. for a zero total solids content. This value is the blank specific gravity for a filtered sludge liquor of both raw and digested sludge.

"The Sludge Triangle"

By transferring values from Figs. 1 and 2, to cross-sectional paper, it was possible to show the inter-relation of all factors affecting the release of water from a chemically treated sludge, namely, per cent solids, per cent volatile matter and specific gravity, as related to ml. of filtrate obtained from the sludge that had been treated as described above. The data, as plotted, produce lines within a wedge shaped triangle. This graph for convenience has been called "The Sludge Triangle" and is shown in Fig. 3.

The proof of any pudding being in eating, it was evident that the test of the applicability of "The Sludge Triangle" depended upon its accuracy when compared to the present standard method of evaporating samples to dryness. To obtain a comparison, for a period of 28 days the proposed method was run in parallel with the standard method.[13] The data on these comparative determinations are shown in Table II.

This table reveals the maximum positive and negative errors based on the standard method, and it indicates that the per cent difference on the average between the two methods is only 0.02 per cent so far as total solids is concerned. This is somewhat surprising since the proposed method actually determines the suspended and flocculatable solids, and does not include the dissolved solids in the expressed liquor. Total solids should be at least 0.1 to 0.3 per cent higher because of this dissolved matter.

For the estimation of volatile matter content, the accuracy of "The Sludge Triangle" appears to be less than for the determination of suspended solids. The average error during the four-week period was 2.43 per cent of the volatile matter content, with wider variations in individual samples than in the case of total solids.

Considering the difficulties of sampling sludges for determination of total solids and volatile matter by evaporation and ignition, it is not surprising that there are some differences between the two methods. It has been shown that sampling[14] is important in sludges of this type. Regarding the accuracy of the method, it appears that the error is much greater when the concentration of

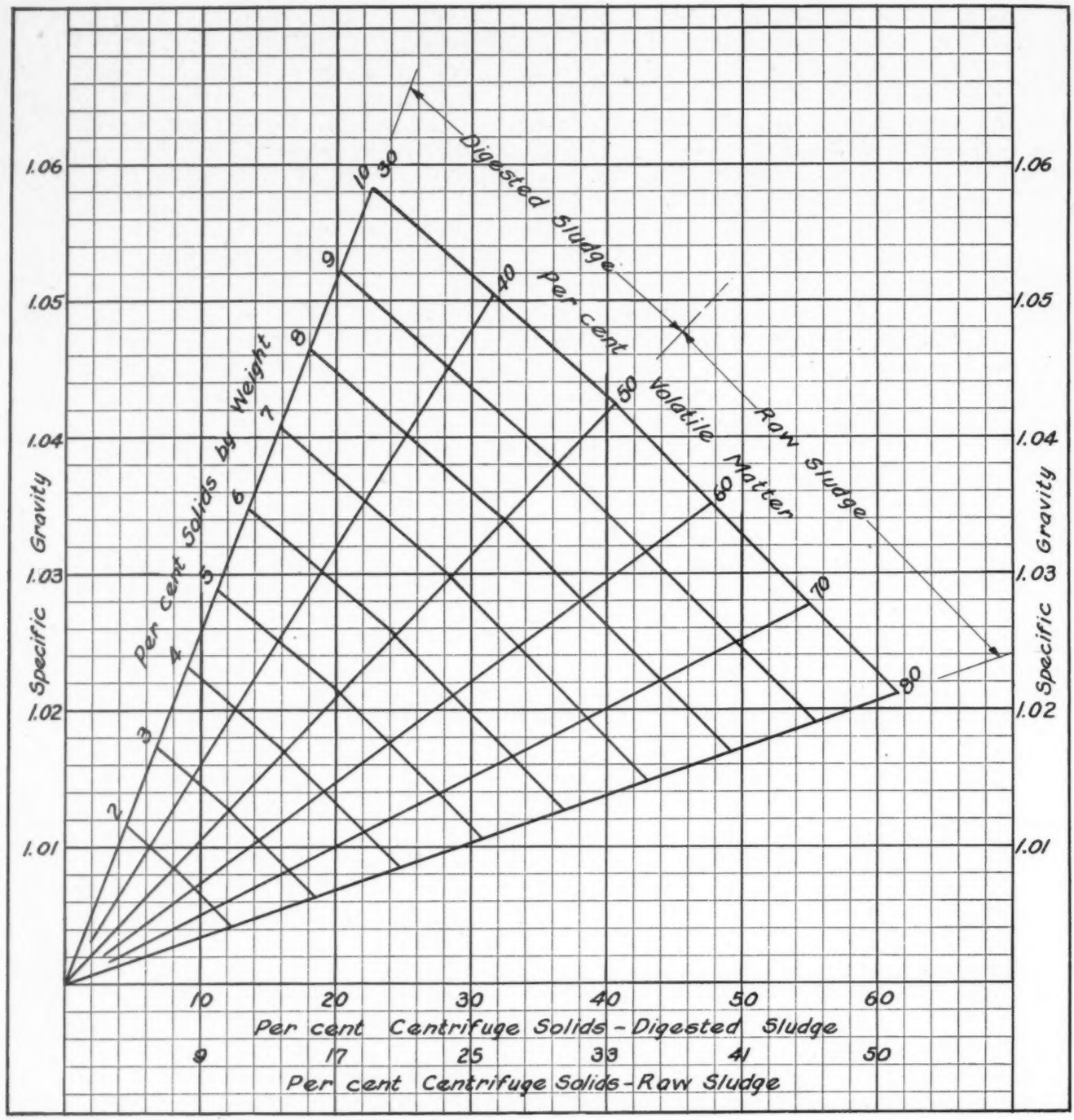

Fig. 4—The Sludge Triangle
(Based on % Centrifuge Solids Instead of Filtrate)

solids is less than 3 per cent. One suggestion for simplifying the technique and, at the same time, increasing the accuracy of the determination is as follows: determine the specific gravity in a 200 ml. Erlenmeyer flask and use the sample thus weighed for the sample to be chemically conditioned and filtered. The gain in accuracy of determining the amount of sample filtered would offset the decrease in accuracy of the specific gravity determination on the smaller sample. (If the 200 ml. flask did not hold exactly that volume, the graph would have to be reconstructed.)

Although this new method, as developed, has advantages over, and therefore might be expected to supplant, the earlier developed centrifuge solids method,[3] it appears possible to develop a "sludge triangle" for the relation of the volume of centrifuge solids to total solids, volatile matter, and specific gravity. Utilizing the data previously published from this laboratory,[3] the graph in Fig. 4 was developed. As might be expected, it is less accurate and therefore of less value than the proposed "Sludge Triangle" method.

A Thorough Test Desired

It must be recognized that this particular "Sludge Triangle" was developed on raw and digested sludge from the Buffalo sewage treatment plant. It is quite possible that sludges from different sewage plants might exhibit different characteristics in this test and therefore this "Sludge Triangle" would not apply directly. Perhaps a specific triangle would have to be developed for each

particular type of sludge. Especially this may be true for activated sludge. It will be of considerable interest to the authors to learn of any attempts to apply this method to activated sludge, or, for that matter, to sludges from any other type of treatment plant. For practical use in the Buffalo treatment works, it appears that this particular method has many advantages for rapid estimation of solids in sewage sludges.

Conclusions

(1) An attempt to develop a rapid method for estimating solids in sewage sludges has been successful. It is possible, by use of a graph, to estimate any two characteristics of a sludge if the volume of filtrate liquor from vacuum filtration of a chemically treated sample, and one other characteristic, are known. These characteristics are per cent solids, per cent volatile matter and specific gravity. The method has been named "The Sludge Triangle" test.

(2) The method depends on the treatment of a measured sample of sludge with known quantities of lime and ferric chloride, measuring the volume of filtrate resulting from vacuum filtration of the treated sample, and determination of the specific gravity of the sludge as sampled. It is possible to perform both tests in ten minutes, after which the total solids and volatile matter content can then be estimated with a reasonable degree of accuracy through use of the "Sludge Triangle" graph.

(3) Also, the "Sludge Triangle" may be used in other ways. Per cent solids may be estimated from volume of filtrate or specific gravity, if the approximate volatile matter content of the sludge is known. Volatile matter may be estimated from the volume of filtrate liquor or specific gravity, if the total solid content is known. Specific gravity may be estimated, if total solids and volatile matter content are determined.

(4) This simple method is advantageous in giving a rapid and fairly accurate estimate of the solids concentration in a sludge. Such is particularly advantageous in plants using chemical conditioning of sludge where the quantity of conditioning chemicals used is dependent to some extent on the volume of water associated with the sludge and/or its content of volatile matter.

Table II

Comparison of Rapid Method with Standard Method for Sludge Analysis

Ml. Filtrate	Sp. Gravity	Proposed Method % T.S.	Proposed Method % V.M.	Standard Method % T.S.	Standard Method % V.M.	Difference % T.S.	Difference % V.M.	Per Cent Error Based on Std. Method T.S.	Per Cent Error Based on Std. Method V.M.
171	1.0408	8.9	46	8.7	42	.2	4	2.3	9.5
172	1.0360	8.3	48	8.6	46	—.3	2	—3.5	4.3
172	1.0360	8.3	48	7.9	46	.4	2	5.1	4.3
177	1.0360	7.7	44	7.6	46	.1	—2	1.3	—4.3
175	1.0360	7.9	47	7.5	46	.4	1	5.3	2.7
173	1.0379	8.4	47	8.4	46	0	1	0	2.7
170	1.0342	8.4	52	7.8	47	.6	5	7.7	10.6
170	1.0332	8.3	53	8.5	47	—.2	6	—2.4	12.8
166	1.0370	9.2	52	8.9	48	.3	4	3.4	8.3
167	1.0361	9.0	53	9.4	50	—.4	3	—4.3	6.0
169	1.0342	8.6	53	9.2	51	—.6	2	—6.5	3.9
160	1.0430	9.9	49	10.0	52	—.1	—3	—1.0	—5.8
167	1.0355	8.9	53	9.4	57	—.5	—4	—5.3	—7.0
161	1.0370	9.8	56	9.5	57	.3	—1	3.2	—1.8
158	1.0389	10.4	57	10.7	59	—.3	—2	—2.8	—3.4
177	1.0255	6.8	56	7.0	61	—.2	—5	—2.9	—8.2
168	1.0229	7.6	66	7.9	62	—.3	4	—3.8	6.5
149	1.0305	10.7	69	10.7	62	0	7	0	11.3
156	1.0295	9.7	66	10.1	64	—.4	2	—4.0	3.1
177	1.0164	5.8	69	6.0	70	—.2	—1	—3.3	—1.4
177	1.0182	6.0	67	5.9	70	.1	—3	1.7	—4.3
172	1.0144	6.3	77	6.2	71	.1	6	1.6	8.5
177	1.0135	5.6	74	5.5	73	.1	1	1.8	1.4
173	1.0137	6.1	77	6.1	74	0	3	0	4.1
169	1.0126	7.4	74	7.3	74	.1	0.0	1.3	0
168	1.0135	6.7	81	6.4	74	.3	7	4.7	9.5
173	1.0145	6.7	76	6.5	74	.2	2	3.1	2.7
184	1.0126	4.6	70	4.7	76	—.1	—6	—2.1	—7.9
Mean	1.0282	7.93	60.0	7.94	58.8	—0.02	+1.25	—0.25	+2.12
Avg. dev. from mean						±0.2	±0.2	±2.76	±3.46
Max. pos. error								7.7	12.8
Max. neg. error								6.5	7.9
Avg. pos. error								3.3	6.2
Avg. neg. error								3.5	4.9

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Velz Appointed Water Consultant by National Resources Board

Prof. Clarence J. Velz, of Manhattan College, has been named by the National Resources Planning Board to act as water consultant for the Middle Atlantic region. Prof. Velz, closely identified with water and pollution problems of this area having conducted surveys under federal and local government auspices in the Hudson River, New York Harbor, and the Elizabeth, Raritan and Hackensack rivers of New Jersey, will act in an advisory capacity to the Drainage Basin Committees of this vicinity.

Prof. Velz will assist Drainage Basin Committees in furthering their work and in the investigation of emergency water and sanitation problems arising from defense activities as well as in planning for post-war readjustments.

JONESBORO KILLS TWO BIRDS WITH ONE STONE

And in So Doing Is Rewarded with Highest Insurance Rating in the State

By LLOYD M. REBSAMEN
Engineer and Manager
WATER, LIGHT AND SEWERAGE
JONESBORO, ARKANSAS

INASMUCH as we operate the entire electric, water and sanitary sewerage systems supplying electricity to Jonesboro and the nearby town of Nettleton, plus some surrounding territory adjacent to both towns, and water and sanitary sewerage to Jonesboro and some surrounding territory, the complete utilization of the advantages of each part of our system by the other parts makes for the most economical operation of the system as a whole.

Very likely if we were operating just a water system it would never occur to us that power requirements for water pumping loads can and do become a serious detriment to the operation of the system supplying electric power. It so happens, however, that in many systems the water pumping peak loads coincide with the peak loads on the electric systems requiring in the case of the electric systems additional facilities to handle these water pumping loads on peak. This happens to be the case with our system, but happily for us the solution was within our own control. We have studied ways and means of bettering the power plant load curves. The design of certain types of electric rates to encourage use of current at periods other than the peak load periods was of help but not sufficient to accomplish what we had hoped for.

The Author

Seeking a Solution

Casting about for other ways to improve this condition, we became more than ever aware of the fact that we were our own worst offender. Through necessity, due to inadequate elevated storage, water pumping was largely on peak with the power plant peak load. Water being our only product capable of storage, we set out to determine what could be accomplished by an addition to our elevated storage, which at that time consisted of a 15-foot diameter by 100-foot high standpipe built in 1897 by the Chicago Bridge and Iron Company. Since only the upper 35 feet gave us adequate pressure storage permissible, shutdowns of our pumps became a matter of minutes, resulting in almost continuous loads on the electric plant.

Our water is pumped from wells. Two wells at the power plant in the northern part of the city pump into a ground storage reservoir from which it is relifted as needed by two circulating pumps into the water system. A sub-station had been located in the southwest part of the city and two wells located there pumped into another ground storage reservoir from which two other circulating pumps relift into the system. Pressures were balanced by the level of water in the standpipe, and this unit had become the bottleneck of the system.

We have been on a program of development of the water system along with the other properties during the past ten years, during which we added sufficient new water mains, valves and fire hydrants to obtain a Class 2 rating from the Arkansas Fire Prevention Bureau.

The author of this article is engineer and manager of the water, electric and sewerage systems of Jonesboro, Ark., which are operated and managed under the Improvement Districts Acts of Arkansas, without political interference or diversion of funds accumulated from operating surplus.

Operation, management and financing is governed by a Board of Directors composed of leading citizens elected by taxpaying voters only, the total taxes paid determining the number of votes to be credited each voter. Each Director serves a term of three years, there being three members elected or re-elected each year to the rotating nine-man board.

The Water and Light Improvement District operates and maintains the sanitary sewer system and treatment plant without additional funds, and no revenue is received for fire service or for street lighting. In spite of this, no indebtedness exists on the water and light system, and out of invested surplus more than $600,000 has been expended during the past four years for improvements to both systems, which have netted for the City of Jonesboro the recently rewarded Class I rating from the Arkansas Fire Prevention Bureau. And, the author writes, "We still have some money left."

This account is written as a further piece of splendid evidence of the value of the Board or Commission form of public utility management, the advantages of consolidation of utilities under one capable and well paid manager employed on a business like basis.

Mr. Rebsamen, a native of Arkansas and graduate mechanical engineer from the State University, has been manager of the water and electric utilities of Jonesboro since March, 1929. His record has been an enviable one, appreciated and appropriately rewarded by his Board of Directors.

Elevated Storage the Answer

An inquiry to the bureau as to what improvements were necessary to make our water system Class 1 resulted in the answer that an elevated storage tank and a connecting water main from the sub-station would give us that most coveted rating.

Our Board of Directors* readily saw the advantages to the entire system and to the city in general of having a water supply system rated in the highest class obtainable and authorized us to proceed with the recommendations of the bureau. [*This Board of nine members comprises the governing body elected by voters to manage and operate the publicly owned water, sewerage and electric utilities in the Improvement Districts authorized by legislative acts.—Ed.]

We had the funds on hand with which to build an elevated storage tank without the necessity of borrowing funds for this purpose. It became very evident that a tank of sufficient size would release power plant facilities from handling on peak water pumping loads and enable us to use these facilities to supply increases in customer load. Pumping of water during the valley load periods of the electric plant would make for pumping economy and also result in bettering the efficiency of the electric plant. So much were these computed savings that they would pay maintenance costs and depreciation on such a tank with quite a little left over as net savings.

Selection of Tank Design

What type of tank to build became the problem. Concrete as well as steel was given consideration. From our files we produced pictures of water tanks, we made inspection trips, we took pictures of many other tanks. Most were very disappointing. They looked just like a water tank. About to despair of finding a clean-cut functional design which had beauty as well as utility, we finally found among the various sketches in our files one by Chicago Bridge and Iron Company which looked like it had possibilities.

We had reached a decision with the Arkansas Fire Prevention Bureau that a tank holding about a million gallons in the upper storage range would not only satisfy them but would enable us to accomplish what we wished in the reduction of peak loads on the electric system.

This sketch happened to be of those proportions. Accordingly, we built at our plant a scale model using the sketch as our guide. As we proceeded with the construction of the model, our interest heightened, and when the model was presented to our Board of Directors their vote was one of unanimous approval.

The model represented a cylindrical standpipe 33 feet in diameter and 70 feet high surrounded by twelve 4-foot diameter cylindrical columns 70 feet high and placed 30 degrees apart on a 70-foot diameter circle. The columns supported a box type ring girder, which together with the standpipe supported an 80-foot diameter by 35-foot range of head spheroidal tank. Since such a large standpipe could very easily be designed to counteract any torsional

Jonesboro's 1,000,000 Gallon Pressure Storage and 500,000 Gallon Emergency Reserve in an Attractive $72,000 "Package" Replaces an Ugly-Duckling and Inadequate 100 ft. High Standpipe

(Not a sway brace used; not five cents spent for dress.)

effects usually controlled by sway braces, *not a sway brace was used.* It appealed from the standpoint of clean-cut design, and *there was not five cents' worth of dress added.* It gave sufficient storage in the upper tank and an emergency supply at lower pressure in the standpipe. It seemed to meet all requirements to perfection, with 1,000,000 gallons pressure storage and 500,000 gallons emergency reserve.

A contract totaling $72,000 was let to Chicago Bridge and Iron Co. for both tank and foundations, which contract was distinctive because of its shortness. Stresses were limited to 12,000 pounds, soil pressures (after study) limited to 4,000 pounds, not including wind load and wind stress for 125 miles per hour, and the whole design subject to our approval.

To make room for the tank on the lot where the standpipe had been located we were successful in buying the balance of a quarter block, which gave us an area of 225 feet by 225 feet, with streets on two sides and alleys on the other two sides. A house involved in the purchase was sold on sealed bids and removed by the buyer.

Construction

Work was started on the foundations of the tank with the center of the base of the tank in the exact center of the lot. The foundations consisted of a solid circular foundation for the standpipe 35 feet diameter at the top and 53 feet diameter at the base. A pipe tunnel for the 18-inch fill and draw pipe and a 12-inch overflow pipe is provided in the heavily reinforced foundation for the standpipe. The overflow pipe is braced to the inside of the standpipe and extended to the 105-foot level, ending in an overflow cup.

The center foundation was poured in one continuous pour. Holding bolts for the standpipe were placed in the top outer edge of the foundation for the anchoring of the standpipe.

The twelve foundations for the support of the columns were then poured, each pier being 6 feet square at the top and 12 feet square at the base. Holding bolts were placed in these piers for the anchoring of the twelve columns. Foundations were placed under the direction of L. P. Jacobsen of the Chicago Bridge and Iron Co.

Erection of the tank was then started under the direction of Foreman Harry Johnson of the Chicago Bridge and Iron Co. The erection derrick was raised in the center of the main foundation and the first ring of the standpipe placed in position anchored to the foundation by the holding bolts. Winch cables were brought out through the inspection door located in the first ring.

The standpipe was built in ten raises with plates starting at ¾ inch on the first ring. The top ring was provided with heavy bracing to carry the stress of the tank bowl. As the tank was an all welded job, specimens were cut from all sections and field as well as laboratory tested.

Upon the completion of the standpipe, erection of the twelve columns was started. These columns, 4 feet in diameter and 70 feet long, were shop built and shipped in one piece full length. They were painted in the shop inside as well as outside and hermetically sealed by welding. The top section of each column had load distributor diaphragms so placed as to carry the load of the tank bowl well down the columns.

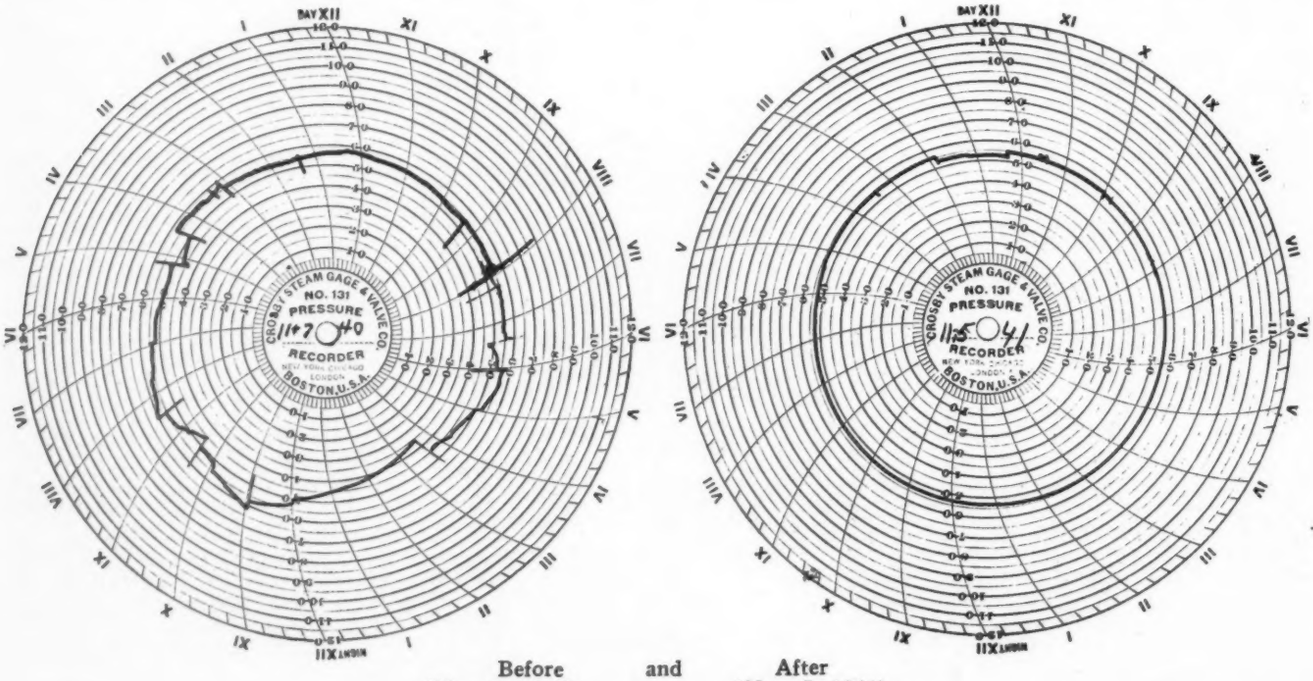
Twelve sections of ring girder were placed in a circle around the standpipe, one section to each column centered over the column center. These ring girder sections were securely braced during erection and exactly placed in position around the

SCHEDULE "W" WATER

First	2000 Gal. used per month	90.0c net.
Next	10000 Gal used per month	27.0c net per M gallon
Next	40000 Gal. used per month	22.5c net per M gallon
Next	50000 Gal. used per month	18.0c net per M gallon
Next	100000 Gal. used per month	13.5c net per M gallon
Next	100000 Gal. used per month	9.0c net per M gallon
All over 303000 Gal. used per month 8.0c net per M gallon.		
Minimum bill for:		
	5-8" Meter	$0.90 per month net
	3-4" Meter	1.80 per month net
	1" Meter	2.00 per month net
	1¼" Meter	3.00 per month net
	1½" Meter	3.50 per month net
	2" Meter	5.50 per month net
	3" Meter	10.50 per month net
	4" Meter	15.50 per month net
	6" Meter	30.50 per month net

APPLICATION: General water service. No more than one residence or more than one business house will be served through one meter. Size of meter to be determined by City Water and Light Plant. Services of 2" and larger subject to minimum contract of one year.

Prevailing Rate Schedule for Water Service in Jonesboro



Before (*Nov. 7, 1940*) **and After** (*Nov. 5, 1941*)

These Pressure Charts Show Eloquently and Tell the Story of Service and Pumping Requirements With and Without Adequate Elevated Storage.

standpipe. The ring girders were of box section design consisting of a base plate, an inside and an outside vertical plate, the top closure being tank shell of the radii of curvature of the tank. Diaphragm bracing was shop built into each section of the ring girder, which was shipped in complete sections for field erection. These sections after trueing into position were welded into one continuous ring.

Bottom plates of the tank were then placed extending from the top of the standpipe to the inside of the top plate of the ring girder, which top plate became part of the tank shell. All plates were shop dished to the required radii.

Above the ring girder one lift of shop dished plates brought the tank up to the equator line with a diameter at this point of 80 feet. The first ring above this equator line consisted of four plates field welded into sections for raising in one piece. The next ring closed in all but a 12-foot diameter circle, which was closed with two dished plates carrying in the center the vent and inspection manhole. This vent was made light tight and as nearly insect proof as possible and was ample in area. Below the manhole a platform was provided for making tank inspections.

Access to the top was by way of ladder rungs welded to one column and ending in a platform at the top of the column. Transfer was then made to a run around ladder attached to the vent at the top and riding at the bottom on a ring angle attached to the extended bottom plate of the ring girder. Rollers attached to the ladder at intermediate points supported the ladder above the tank shell.

Dismantling of the derrick was through one bottom plate of the tank, which had been left out for that purpose. After the removal of the derrick the floor plates of the standpipe were placed and welded upon an oiled sand cushion. Cement grout was then placed under the outside base of the standpipe and under each column base.

Upon completion the tank was slowly filled and observations made to check on settling. No appreciable settling was noticed at the time of filling or has any been experienced since.

Cathodic Protection To Be Added

For internal protection, initially painting of the tank was adopted,

A Ground View of the New Tank at Close Range

since electronic protection had at that time not been sufficiently proven or so widely adopted as now is the case. However, we are at present planning to install this method of interior protection, which with the initial paint protection should provide the most effective overall protection procurable. Two coats of chromate primer were used on the inside. On the outside one coat of chromate primer was applied as the base for two coats of aluminum.

The tank was placed in service November 14, 1940, and has been in continuous operation since.

Results Observed

The 18-inch filler pipe was laid a short distance to the alley and connected into a 12x12x18-inch tee, from which two 12-inch lines tie at crossings with other lines of the system, giving a rather complete dispersion of circulation within a short distance. This effect was particularly noticeable at the pumping stations in the reduction of the difference between the on and off pressures registered on the gauges.

The top water line of the new tank is only 5 feet higher than the top of the old standpipe, but the general pressure on the system is considerably higher with the new tank, due probably to the removal of bottlenecks in the system supplying the old standpipe.

The power consumption per thousand gallons of water delivered into the system showed a marked drop. We are now pumping a thousand gallons for an overall system use with only 1.4 kilowatt hours.

To say we are pleased with the results is to put it mildly. The two charts here exhibited were obtained from the gauge at our office, which is located midway between the new tank and the main plant. The first chart taken November 7, 1940, is with the old standpipe in operation. The second chart was taken on November 5, 1941, with the new tank in service. Just a year apart these charts graphically show what can be done with elevated storage in its effect on pressures and service in general. Also, this has been by far our best water year as far as use and revenues are concerned. Some of this can no doubt be attributed to the fact that at the higher general pressure more water is used by customers.

Results on the electric plant were as anticipated. We were able to drop approximately 300 horsepower of well and circulating pump motors from the on peak period and to considerably fill in the valley periods of the load curve. This release of plant capacity on peak is at this time most important to us due to the present state of affairs, which makes it very difficult if not almost impossible to obtain equipment necessary for plant additions. We feel that we are most fortunate in having provided this addition to our water system, as well as other betterments, well in advance of the present emergency.

Needless to say, the Arkansas Fire Prevention Bureau made a complete survey of the effect of the new tank on the water system and also other water line improvements. It was found that their own anticipations have been exceeded and we now enjoy the only Class 1 rating in the State of Arkansas.

Landscaping of the ground makes the old "ugly duckling" standpipe lot a spot of beauty with a stately structure rising at the center. Some comments heard about the tank: "The greatest combination of beauty and utility I have ever seen"; "A beautiful tank"; "We should all be proud of this tank and our water system." I could give you many more but these few seem to express most of the opinions.

And another hidden "beauty" of the tank is that it is all paid for and completely ours. No outstanding bonds to be paid off. No borrowed money to worry about. The highest attainable insurance rating. Improved service and more efficient and economical operation of two utilities. These are the advantages realized from this latest improvement added to the water and electric systems of Jonesboro.

For those who may be interested in the water rates of Jonesboro, the accompanying published schedule is being reproduced.

IRON REMOVAL*

With Particular Reference to a Method of Interest in Connection With Small Systems

By H. E. LORDLEY
Plant Manager
DEPARTMENT OF PUBLIC UTILITIES
RICHMOND, VIRGINIA

IN THE country today we have excellent large water purification plants with competent engineers and operators, yet in number these plants represent only a very small percentage of our water supplies. Thousands of small supplies having only a deep-well-pump and storage tank challenge the water works engineer with problems that must be solved with limited expenditures and with unskilled operating personnel. Of the many problems, economical methods of iron removal are of major interest.

Effects of Iron

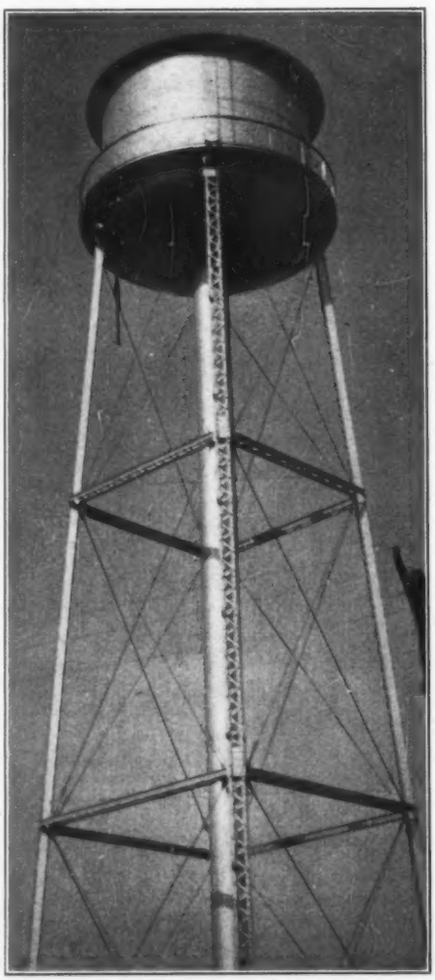
Negus (1) states that iron salts, ferric and ferrous in drinking water are harmless physiologically. The Treasury Departments standard of 0.30 ppm (Fe) is rather for taste and color considerations than for physiological reasons. However, industry requires iron-free water in processing cotton, woolens and silk and in the manufacture of rayon. When iron is present soft drinks and wines develop a precipitate in the bottle and white paper manufacture is impossible; tanning of leather is difficult, and dyeing of materials is spotty and uneven. In the consumer's home, iron stains the fixtures, leaves stains in laundrying white clothes and many similar complaints of which we are all familar. In the distribution system, Crenothrix, an iron bacteria, may decrease the capacity of the system if soluble iron is present to encourage its growth.

Forms of Iron

Iron may occur in water either as organic iron, inorganic iron or a combination of both types. Ferrous bicarbonate is one common inorganic form of iron occuring in many supplies. Iron in combination with humic acid or other complex organic compounds may be classified as organic iron, and is usually found in wells located in swampy areas. It requires only a few simple tests,

The Author

that anyone can run. even without laboratory facilities, to determine the type iron. Collect a sample and allow it to stand exposed to the air. Inorganic iron will precipate, leaving the sample cloudy. On the other hand, organic iron fails to precipitate and the problem of removal is more complex thereby.



An Elevated Tank Doing Double Duty
(Storage and Clarification)

Methods of Removal

Methods of removal may be classified as (1) Direct Chemical Reaction, (2) Coagulation, (3) Special Filters.

Under No. 1 we have aeration as the most economical method. Aeration, requires only 0.14 parts of air per part of iron when carbon dioxide is not present. The iron is oxidized to insoluble ferric iron which precipitates and settles to the bottom of a tank or is removed by a standard sand filter. Frequently, this small amount of air can be introduced by some form of air pump or "sniffer" attached to the well pump. (2) In an open system a tray aerator followed by sand filtration removes the iron. Organic iron is combined chemically so that such a simple treatment will not break down the organic bond.

The second method involving direct chemical reactions utilizes chlorine for the oxidation of the iron instead of aeration. In addition, the chlorine treatment removes any troublesome sulfuretted hydrogen often found in conjunction with iron, and produces a sterile water having a definite residual chlorine. This is a cheap method since solutions of "Perchloron" or "H.T.H." are convenient sources of chlorine and can be applied to small supplies without difficulty.

Caustic Soda removes iron from water by raising the pH to range 8.0-10.0. At the high pH the oxidized iron precipitates as ferric hydroxide and is removed by settling or filtration. This treatment also has the advantage of removing free carbon dioxide and protects the system from corrosion.

Potassium permanganate has been used (3) to oxidize organic iron by first attacking the organic compound and allowing the iron to precipitate as hydrous ferric oxide or a combination of ferric iron and organic matter.

In this discussion of direct chemi-

*This paper, written for publication in "Water Works and Sewerage," was presented in substance before the Virginia Section of AWWA, at Roanoke, Va.

cal methods, none of these suggested methods removed organic iron with any degree of success so that we use the old standby, coagulation with alum. Organic iron occurs in a colloidal state with humic acid, cellulose, and other end products of plant decomposition. Alum coagulation followed by filtration will remove this form of iron.

Contact Bids

Special filters, the third classification, are excellent in many cases and are very easy to operate. These filters are standard pressure filters, having a material of the same general characteristics of filter sand but impregnated with the higher oxides of manganese (MnO ; Mn_2O_7). Water supplied to the filter must have an oxygen content equal to 15% of the soluble iron content for the oxidation process. The iron in the presence of oxygen and by the catalytic action of the manganese, is converted to insoluble iron and is removed by the filtering material. In backwashing, the precipitated iron is washed out and the filter is ready for use without regeneration. Occasionally the sand is treated with sodium permanganate to aid the catalytic action of the manganese. Even these filters fail to remove organic iron in some cases and should be installed only after analyses and surveys indicate that such contact materials will remove the iron.

Ordinary sodium zeolite filters will remove iron by exchange as shown by the following reaction:

$$Na_2Z + MnO : Mn_2O_7 + 4Fe(HCO_3)_2 = Na_2Z + 3MnO_2 + Fe_2O_3 + 8CO_2 + 4H_2O$$

There are some plants that use one set of two of these filters to soften the water and another similar set to remove iron and manganese. Many different materials have been used in filters, from pyrolusite to coal, and new materials are coming into use in this very promising approach to iron removal each year.

A Case at Point

With this introductory discussion as a basis, several plants designed by Mr. M. C. Smith and the author will illustrate the practical application of these methods. The City of Richmond operates a deep water freight terminal below the City which has a domestic water supply from a 280 foot drilled well. Shortly after opening the terminal the domestic water developed bad tastes and odors and also deposited an iron stain on all the fixtures. Samples direct from the well and from the distribution system had the following analysis:

Table 1.

	At Well	*From Mains*
pH	6.0	6.4
CO_2	41	31
M. O. Alk.	40	65
Color	6	27
Turb.	1.5	3.0
Fe	10.0	8.0
H_2S	Present	None

When the samples were first collected the water was clear but after standing a few hours it became cloudy and indicated inorganic iron. After a few jar tests this theory was proved by the ease of oxidation with any of the direct chemical methods. Finally a combination treatment using both chlorine and caustic soda was selected for the job for the following reasons:

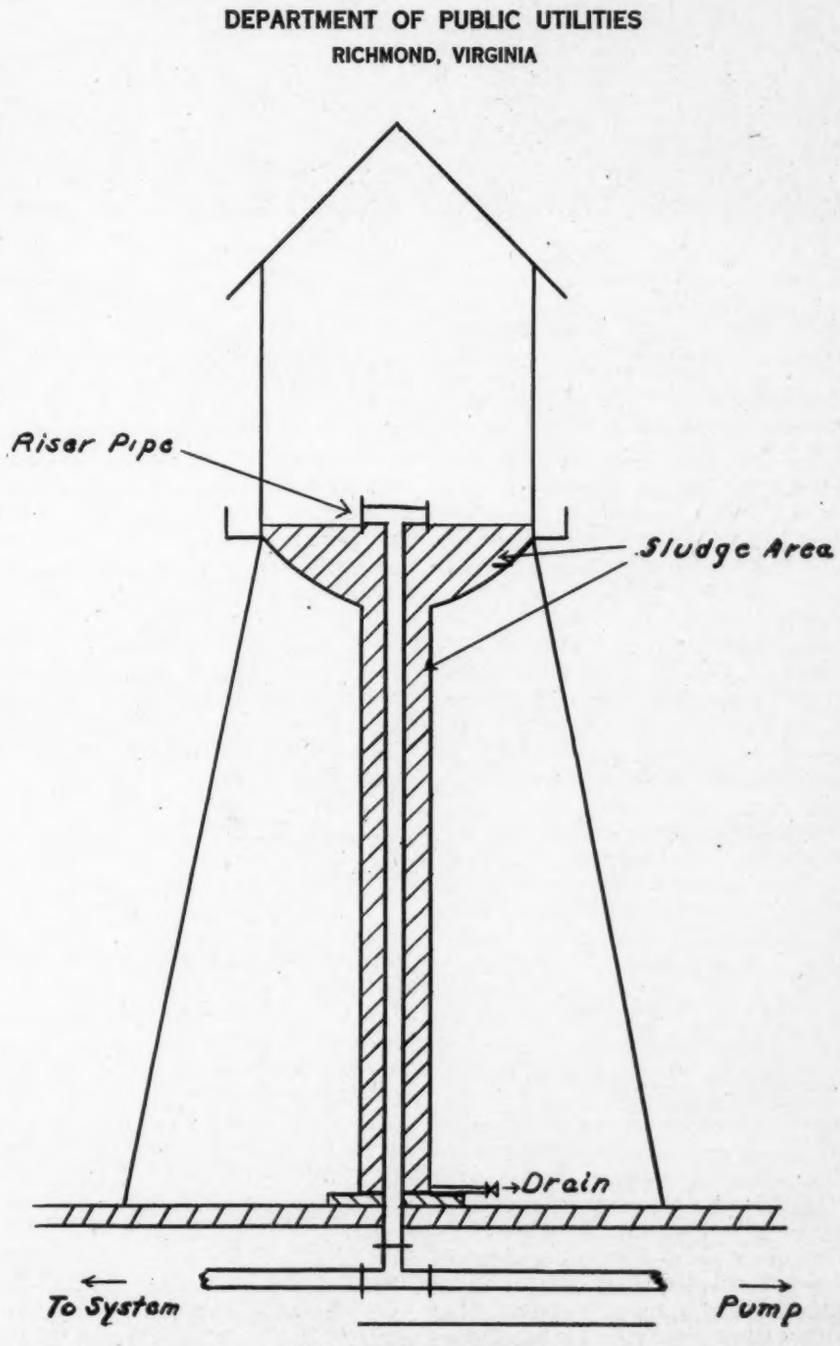
(1) The treatment removed ferrous iron in a heavy floc without the expense of aeration.

(2) Eliminated carbon dioxide and prevented corrosion.

(3) Eliminated sulfuretted hydrogen.

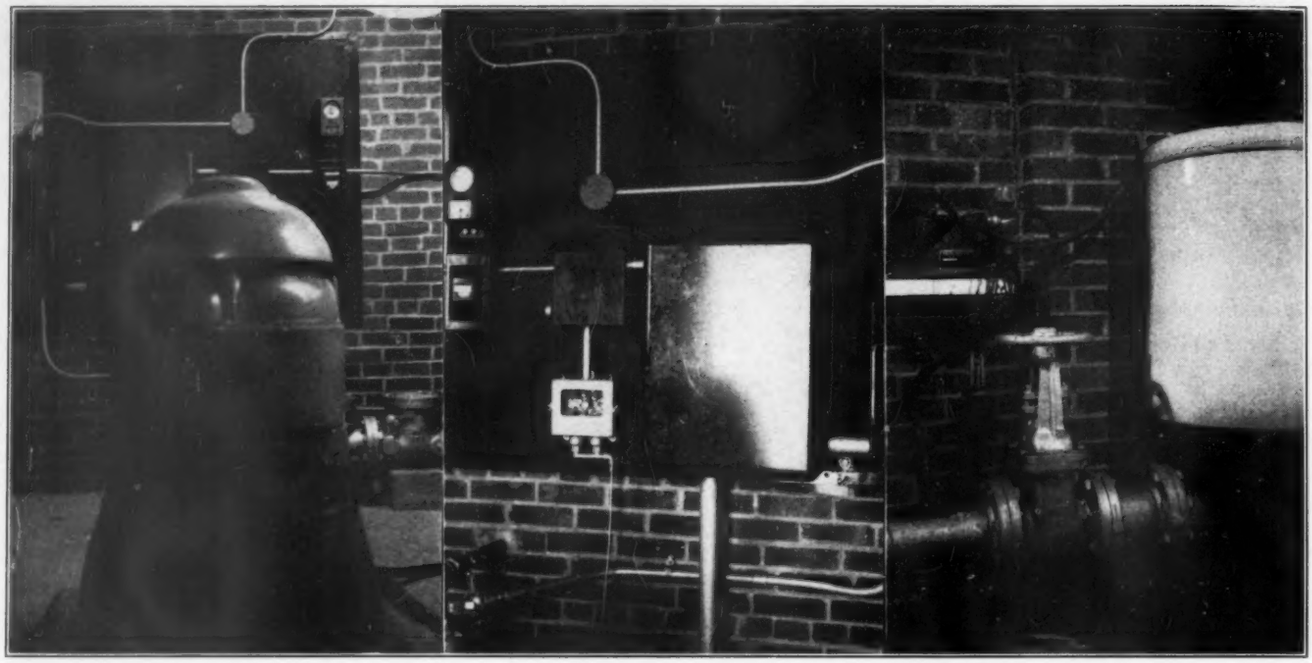
(4) Sterilized the water and gave a residual chlorine.

(5) The two solutions could be



Sketch of Converted Tank

Reveals simple changes made in extending the riser pipe and adding a tee to provide the shaded sludge separation zone. Accumulated but sterilized iron sludge is blown off systematically at the bottom of the original riser pipe.



Deep Well Pump
Operated on a time-pressure program.

Control Panel
Time Switch, Magnetic Starter and Pressure Switch.

Double Duty Chloro Feeder
With 40-gal. crock of caustic soda and hypochlorite solution.

mixed in the same crock and fed through one feeder.

Elevated Tank As Settling Basin

The City had appropriated only $500 for the job, so we were forced to use the elevated tank as a settling basin and purchase only a heavy-duty Proportioneer's feeder, 40 gallon crock, time switch and a few lengths of pipe. The 30,000 gallon storage tank was of conventional design with a short riser pipe within the 36" standpipe. This short riser-pipe was extended to about five feet above the bottom of the tank as shown in the accompanying sketch. Of course, this reduced the available water storage but furnished a settling basin in the bottom of the tank for the sludge, which settled so rapidly and completely that no filter was necessary.

In this system, as is true of other small supplies, little or no water was used after 9 p. m. so a time switch was adjusted to start both the pump and chemical feeder simultaneously at that time. This program also prevented untreated water from going into the system. A mercoid pressure switch in series with the time switch controlled the elevation of water in the tank. In this case the pump only operates a short time each night so the floc all settles before the draw comes on at 7 a. m., and gives a clear supernatant for consumption. About once a week the drain valve at the bottom of the standpipe is opened to remove the sludge from the tank.

The operating personnel could give the system only a weekly inspection and the chemical solutions were difficult to prepare in such a short time. However, in most cities some company manufactures liquid bleach and has a regular delivery system. In producing bleach 20% caustic soda is treated with chlorine to give a 15% available chlorine solution. In this case, the dealer delivered both 20% caustic soda and bleach direct to our 40 gallon crock. As the result the operators at the terminal did not have to prepare any solutions. In addition, the treatment was constant and the danger of inexperienced men handling chemicals was eliminated.

Results

After a few adjustments and flushing of the system, the water was of excellent quality and could be used for all domestic purposes. Table 2 reveals the gratifying results with this treatment as evidenced by samples taken from the piping system.

Table 2.
Dose. Caustic Soda 200 pmg. (100% NaOH) Chlorine 8.34 pmg.*

	(Before Treatment)	*(After Treatment)*
pH	6.4	9.0
CO_2	31	0
M. O. Alk.	65	110
Phenol. Alk.	0	7
Color	27	10
Turb.	3.2	0.60
Fe	10	0.01
H_2S	Present	None

*pmg. = pounds per million gallons.

Another Case

Never take iron for granted, for sometimes you realize that nature cares nothing for the theories of mankind.

Take for example a 284 ft. deep well only five miles from the above supply. Table 3 reveals the characteristics of its water.

Table 3.
(Well No. 2)

pH	7.3
CO_2	9
M. O. Alk.	136
Color	28
Turb.	1.5
Fe	3.0
H_2S	Present

We expected this water to respond to the same treatment but after a series of jar tests we found that the iron was in the organic form and required an elaborate filter plant with chlorination, alum coagulation, settling, filtration and pH correction to give the same quality effluent as produced by the simple chlorination, alkalinization and settling plant. Only three miles from this supply another deep well needed only chlorination and settling in our special tank to give an excellent water, so you never know about the fallacies of water until an actual study is made of its amenability to a given treatment.

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THE VIRGINIA SECTION RETURNS TO ROANOKE

For the Best Meeting in Several Years

ALL WHO attended the last meeting of the Virginia Section of A.W.W.A. in Roanoke, Va., long remembered this "Little Convention" as we referred to it in this magazine.

After several years of less satisfactory meetings of the Section, including a trial at holding meetings for two years at the University of Virginia, the Section voted to return again to Roanoke, where Hotel Roanoke has superb facilities for such meetings and Roanoke's location is strategic for good attendence.

R. W. Fitzgerald, Supt. of Filtration Norfolk, Va. (Retiring Pres.)

Roland Leveque, Richmond, Va. (Incoming Pres.) Phipps & Bird, Inc.,

On the last two days of October the Virginia Section held the most successful meeting in several years at Hotel Roanoke. There seemed, in fact, to be a general feeling that in alternate years the Section should meet in Roanoke and in intervening years in Richmond, where also the attendance has always been good.

The Entertainment

The Section went in for entertainment only to modest extent which consisted of the Annual Dinner presided over by Roanoke's "Doc" Taylor as Master of Ceremonies. The feature of the evening was the hour of "Tricks and Magic" put on by H. Lloyd Nelson, Eastern Sales Manager for U. S. Pipe and Foundry Co. Those who have seen our curly-headed magician No. 1 in A.W.W.A. perform will know that the show was equal to or better than those for which professionals draw a good fee. Aside from that inter-mural talent is always more interesting than the hired variety.

Following the show there was a movie showing the history of water from the clouds through the purification plant and the sewage treatment works back to the rivers and clouds. The operation and functions of the plants were shown by animated wash drawings in a manner readily comprehended by the layman for which this movie was prepared by the Cast Iron Pipe Research Association. We understand that it can be borrowed for showings before civic associations. It is the best thing of its kind that we have yet seen.

"Doc" Taylor Honored

At the close of the evening's festivities the Geo. W. Fuller Award Committee through its Chairman, Richard F. Wagner, announced that the coveted award had been voted to D. R. Taylor, Plant Sup't of the Roanoke Water Department, the citation reading—"For his leadership in the technical programs, and in general for his work as a 'wheel-horse' in the Virginia Section.

"Further, for the splendid qualities exhibited by the recipient in his public relations work and inspirational talks on this important topic. In addition, for his studies in metering practices which have yielded considerable of marked value in this important phase of water works operation."

Secy., Treasurer and Boss.
(All of the Va. State Dept. of Health)

Norman J. Phillips, Jr., Asst. Engr. (Secretary)

Major Richard Messer, Chief Engr. (His Va. Water and Sewage Wks. Assn. was "Daddy" of the Va. Section)

E. C. Meredith, Asst. Engr. (Treasurer)

It is with sincere regrets that this reporting of the meeting of the Virginia Section has been so long delayed, the reason therefor being beyond the control of the writer.

Inasmuch as its preparation has proved difficult from such cold notes it is possible that there may appear some deficiencies to those who presented the papers, but we trust that there are no errors of consequence. Should there be, however, we shall gladly run a correction if the author will call the error to our attention.— L. H. E.

Louis R. Howson, Consulting Engr., Chicago (Pres. of AWWA)

R. C. Bardwell, C. & O. Railway, Richmond, Va. (AWWA Director)

Officers for the Next Year

The following officers were announced as elected or re-elected for the ensuing year.

Chairman

Roland J. Leveque, Phipps & Bird, Inc., Richmond, Va.

Vice-Chairman

C. L. Crockett, Chief Chemist, N. & W. Ry., Roanoke, Va.

Secretary

Norman J. Phillips, Asst. Engr., Va. State Dept. of Health, Richmond.

Treasurer

E. C. Meredith, Asst. Engr., Va. State Dept. of Health, Richmond.

Trustees

Major J. C. Haynes, Lexington.
R. W. Fitzgerald, Norfolk.

Technical Sessions

(Chairman R. W. Fitzgerald, Presiding)

The Technical Sessions opened with a brief review of the Toronto Convention by R. C. Bardwell, A.W.W.A. Director from the Virginia Section. Then followed the opening paper by Dr. M. H. Stow, Professor of Geology at Washington and Lee University, which constituted an outline of "The James River Project of the Virginia Academy of Science," which comprises a survey and preliminary study of the uses and abuses of the James River by industry and municipalities.

"A Water Supply for Chesterfield County, Va." by Stuart Royer, Consulting Engineer, Richmond, Va.

The author had been retained to report on a proposed water supply for Chesterfield County, just south of Richmond, as authorized by the Va. legislature under the Water Supply and Sewerage District Act.

In the studies made the possibilities of taking treated water from the Richmond supply at 18 cts. per 100 cu. ft had been considered against developing a ground water supply and both against developing surface supplies. Because of uncertainty of wells (past experience) in the county surface supplies were chosen as the most practical and economical overall source. It had been decided to construct two filter plants of 1.5 mgd. and 1.0 mgd. capacities, respectively, on Falling Creek and Swift Creek with a storage dam on the first and 100 miles of distribution mains and adequate elevated storage designed for a two level system.

Mr. Royer gave some interesting and surprising stream flow statistics gathered during the 1941 dry period when one of the streams with an 80 square mile drainage area was flowing at the startlingly low rate of only 127,000 gals./day in October, thus

Richard F. Wagner, Director Public Wks., Lynchburg, Va.

Col. W. A. Hardenberg, San. Corps, U.S.A., Washington, D. C.

Chas. E. Moore, Water Dept. Manager, Roanoke, Va.

revealing the necessity of constructing a storage dam which only this extreme dry year would have revealed as a necessity.

The system is being financed at a cost of $2,279,000 by a W.P.A. grant of 66% and the county standing 34% of this cost. It is estimated that a domestic rate of $1.25 monthly and commercial rate of $6.25 will pay all operating and carrying charges.

"Defense of Water Supplies for the Army and the General Public," by Col. W. A. Hardenberg, Sanitary Corps, U. S. Army, Washington, D. C.

After reviewing the minimum standards of design for cantonment water supply systems Colonel Hardenberg gave some interesting statistics concerning water requirements for forces in the field and how these were being met with mobile purification units. It was learned that experiences gained in the last World War were of no value in this day of rapidly traveling mechanized armies. The original allowance of 2 gals. per man per day and 1 gal. per day per vehicle had proved too low for modern warfare, the British experience revealing 3 and 2 gals. respectively, to be needed. For our armies 4 gals. per day, per man, is being provided for with the requisite number of small portable filtration - sterilization units with maximum output of 20 gpm. at a filtration rate of 4 gals/sq. ft./min. Each Engineer Regiment carries 3 such units.

D. R. Taylor, Plant Supt., Roanoke, Va. (Voted Fuller Award)

C. L. Crockett, N. & W. Railway, Roanoke, Va. (New Vice-Chairman)

Regarding protection of public supplies Col. Hardenberg was of the opinion that dangers from bacterial and poisoning chemical injections had been over emphasized but watching the weakest points on the system was of course desirable. As to attempted water supply contamination by war gases or liquids the simplest and sufficient test was the ordinary oxygen consumed test with permanganate. This test would reveal any concentrations of dangerous proportions. And, said the Colonel, don't worry too much about this because activated carbon is capable of removing all dangerous amounts should there be an indication shown by a sudden increase in the oxygen consumed values of the untreated water. Modern chlorination practice would take care of any bacterial contamination which would be at all attainable.

"The Present Status of Priorities and the Work of A.W.W.A.'s Defense Committee," by Reeves Newsom, Consulting Engineer, New York.

Mr. Newsom in presenting this review of developments as a substitute for E. F. Dugger, of Newport News, gave as clean cut a picture of the situation as has ever been presented. However, there have been amendments made to O.P.M.'s important Order P-46 since and these are all so ably set forth in Mr. Newsom's review of "Developments of 1941 in Water Supply" which is the featured article in this issue that it is unnecessary to cover the same ground in this column also. It is well to emphasize, however, what Mr. Newsom did concerning the two important forms to utilize. The original PD-1 form is the proper one to file when seeking new equipment for replacement, additions or entire new projects. For materials and equipment properly classified as maintenance, repair, operation and minor extensions of service no form is required. It is only necessary to state with the order to the supplier that the order is being placed under authority given in O.P.M. Order P-46. Only by so doing can the supplier safely accept the order with any expectancy of securing replacement materials. For further and important statements see Mr. Newsom's review of Priorities Developments.

In reply to questions Mr. Newsom said that Order P-46 would unquestionably be amended from time to time, but there was no indication that it would be scrapped for something different. The first amendment

L. J. Stockner, Supt. of Water and Sewage, Galax, Va.

M. C. Smith, Chief Engr., Dept. Utilities, Richmond, Va.

Wm. S. Myers, City Engr. and Supt. of Wks., Harrisonburg, Va.

already contained a liberal allowance of $1500 in materials alone for main and service extensions to be accepted as maintenance and minor extensions materials.

"Developments in Super-Chlorination Practices," by A. E. Griffin, Asst. Director, Technical Service Div., Wallace & Tiernan Co., Newark, N. J.

Mr. Griffin's talk, illustrated by helpful graphs revealing the behavior of the excess chlorine curve for various waters, stressed the important role played by ammonia in super or "break-point" chlorination. He pointed out that waters low in ammonia exhibited little or no "break-point" on the rising residual chlorine

"Programmers"
A. B. MacTaggart, Gen. Mgr., Rusta-Restor Corp., Fremont, Ohio

H. E. Lordley, Supt. of Filtration, Richmond, Va.

Chris F. Bingham, Dist. Mgr., Columbia Alkali Wks., Philadelphia, Pa.

(Formerly Supt. of Filtration at Richmond and Long a "Wheelhorse" in the Va. Section)

curve. With waters containing ammonia the "break-point" is usually not reached until the chlorine applied is 10 times the full ammonia content of the particular water and explains the intensity increase of the break when highly polluted waters are chlorinated.

An indication that the "break-point" has been reached or passed in chlorination is the behavior of the ortho-tolidin test. Less chlorine residual than required for "break-point" reactions with taste destruction and complete bacterial kill is indicated by a gradual rise of color developed in the test over a period of 5 to 10 minutes. The so-called "flash test" indicating effective "break-point" chlorination is that which returns a maximum color development in a matter of seconds following the addition of ortho-tolidin reagent. While not a 100% indicator the test is almost that conclusive as confirmed by series jar tests involving incremental increases in chlorine dosages applied followed by reasonable periods of contact up to 3 hours.

Concerning another important consideration, Mr. Griffin pointed out the influence of pH values. The most rapid super-chlorination reactions take effect at neutrality—pH 7 or close thereto. The upper and lower limits for best returns are pH 6.5 and pH 8.5—indicative that super-chlorination is hazardous in connection with water softening unless applied subsequent to recarbonation or well in advance of the lime application.

Mr. Griffin pointed out that at the true "break-point" color is precipitately removed, mineral types of bacteria (iron-mongers, sulphide producers, slime makers) are thoroughly eliminated. Manganese is completely removed along with iron if present. An interesting experience revealed that 8 ppm. of chlorine precipitated all manganese only after 20 hours of contact whereas 20 ppm. of chlorine did the same job in 3 hours.

In reply to a question Mr. Griffin stated that temperature had not proved as important as at first thought. While temperature increase did speed reactions somewhat the effect was too slight to be of importance in the range of natural temperature changes of waters.

"Black-Light" in the Laboratory

"Applications of Ultra-Violet Fluorescence in Laboratory Problems," by C. L. Crockett, Chief Chemist, Norfolk and Western Ry., Roanoke, Va.

Mr. Crockett, with the aid of interesting demonstrations with one of the so-called "black-light" bulbs used in black-outs for marking streets, bomb shelters, etc., described some of the applications of this queer light in the laboratory. The most spectacular demonstration was the acid-alkali titration in which quinine sulphate is the indicator that causes the whole titration beaker to fluoresce in a flash when all alkali has been neutralized and the titration is complete. In other words, in alkaline medium the quinine does not fluoresce in black ultra violet light (not more than a glow) but does in slightly acidic medium. Another demonstration vividly revealed oil stains on cloth or paper which could not be seen under ordinary light. It is also said that some organisms can be identified by this queer light, including the T.B. organism and cancer tissue.

Mr. Crockett pointed out that so-called "black-light" has marked possibilities in aiding chemists in many directions and deserves further exploration. In reply to questions he stated that the bulb being used was a Westinghouse TT-16 Black-Light Bulb which costs $12.00. The transformer required for its operation on A.C. current costs $5.00.

"Removal of Iron from Small Water Supplies," by H. E. Lordley, Supt. of Filtration, Richmond, Va.

Mr. Lordley's interesting paper is printed in full elsewhere in this same issue. In brief, it told of an exceedingly simple and inexpensive scheme of removing iron and correcting the corrosivity of a small water supply wherein the lower portion of an elevated tank was converted to iron precipitate separation while the upper portion served as the clarifier and for storage. The iron is oxidized with hypochlorite and the pH corrected simultaneously with caustic soda, the two chemicals being

"Mike" Siebert, Neptune Meter Co., Richmond, Va.

Reeves Newsom, Consulting Engr., New York City

R. Stuart Royer, Consulting Engr., Richmond, Va.

dissolved in one crock and fed together through a Proportioneer's "Chlor-o-Feeder" to the well pump discharge to the elevated tank. Thus, expensive aeration is avoided and the whole expense consists of the chemical feed equipment and extending a riser into the elevated tank in order to draw clarified water from the upper two-thirds of the tank. The operating scheme involves tank filling during the night and drawdown for service during the day. For further details and a general discussion of the problems of iron removal read Mr. Lordley's article, which would appear to have application to a large number of those small supplies containing iron or picking up iron from the distribution system.

In the discussion which followed Mr. Lordley's paper, questions were asked and answered regarding the application of "Calgon" in corrosive suppression and prevention of iron precipitation and red water complaints. The points brought out are, however, being transferred to the "Question Box" in which corrosion and iron troubles were generally discussed in the closing session. This is in order that the reader may have the complete discussion of the iron problem in the one section of this report.

"The Water Supply Works of Norton, Va." by W. P. Kanto, Town Manager, Norton, Va.

Mr. Kanto described the rehabilitation of the mountain water supply works of the Norton system, consisting of an impounding reservoir, a filtration plant and clear water storage in wooden tanks on the hillside below. The W.P.A. rehabilitation project consisted of reservoir repairs to stop the 50,000 gpd. leakage which had cost Norton a completely dry reservoir in November, 1939, necessitating temporary return to the old corrosive and hard well supplies, abandoned for the soft mountain water. A new concrete clear water storage basin has replaced the leaky wooden tanks and a 60,000 gal. steel wash water tank and a pump installed.

J. M. Diven, The Leadite Co., Philadelphia | *Albert Wilson, Jr. Supt. Filtration, Fredericksburg, Va.* | *Bruce Harkness, Tate Pipe Linings, Andover, Mass.* | *H. W. Hayes, Supt. of Water, Lawrenceville, Va.* | *R. D. Wright, Asst. Water Engr., Lynchburg, Va.* | *J. N. Phelps, Phelps Water Co., Roanoke, Va.* | *H. B. Crane, Engr., Intl. Filter Co., Chicago*

At one time an investigation revealed a 40 per cent water loss between the supply source and consumers' taps—Norton being 100 per metered—necessitating a major repair program for the distribution system as well as the supply works. Now the stored supply is good for a period of 2 months under dry weather conditions exceeding those which culminated in the drying up of the reservoir in 1939.

Mr. Kanto then explained the corrective treatment applied to the Norton water for corrosive suppression. Lime is applied in amounts determined by the Enslow Stability Indicator—i.e., to a point where the water will not pick up any calcium carbonate during passage through the indicator. The following are the characteristics of the very soft filtered and lime treated waters.

	Filtered	Stabilized
pH	6.8	8.5
Mo. alk.	5.	16.5
Phenol. alk.	0.	3.5
CO_2	1.	0.

Further possibilities of extending corrective treatment of the Norton water were discussed in the "Question Hour."

Water Main Cleaning

"A Water Main Cleaning Experience," by Chas. W. Davis, Supt. of Water, Petersburg, Va.

Mr. Davis described a situation in which it appeared that a 16-in. C.I. force main 17,000 ft. long bringing raw water to the Petersburg Filter Plant would have to be paralleled in order to meet supply demands. Investigation of the economics of cleaning this main resulted in a decision to resort to this procedure first. The facts and results follow.

The job was done by the National Water Main Cleaning Co. on contract at 7 cts per foot. The cleaning machine traveled through the 3 miles of 16-in. main in 3 hours, necessitating only 6 hours of total out of service period and a total expense of but $1,300. The results of the cleaning showed a decrease in friction from C = 70 to C = 125 and a delivery of 3.2 mgd. as compared to 1.8 mgd. before cleaning—a 63 per cent increase. The saving in power costs for pumping has amounted to $650 monthly over a 3-month period during which the friction coefficient has only dropped back about 10 per cent from the C value of 125 observed immediately after cleaning.

"The Steel Filter Plant of Richlands, Va." by I. T. Jessee, Town Manager, Richlands, Va.

Mr. Jessee presented a rather too brief description of the steel filter plant of Richlands which was installed by the Pittsburgh-Des Moines Steel Co., and consisting of a circular spiral baffled coagulation and clarification tank and a filter of 250,000 gpd. capacity. The coagulated water enters the tank at the periphery and travels the spiral course to the center take-off to the filter. The plant is operated only 12 hrs. daily and cost only $22,600.

L. H. Enslow commented on the wisdom of providing oversized plants and ample elevated or hillside storage for small towns, the point of interest being the overall economy which results from operating such oversized plants for a single shift and the ample storage which makes for the possibility of using only off peak power for pumping at decidedly more attractive rates. It would in general be found that the added investment would yield handsome dividends in power cost reduction and savings in operator's pay when only one shift is required.

An Epic in Mountain Water Supply

"Some Experiences With the Water Supply System of Washington County, Va." by J. B. Vance, Maintenance Manager, Washington County Sanitary District, Abington, Va.

Without question the telling of the series of mishaps and epic adventures in maintenance of the mountain water supply system of Washington County, Va., by Mr. Vance was one of the most thrillingly told stories by a "broncho-busting" repair and maintenance superintendent that it has ever been this writer's privilege of hearing. Of course to better appreciate this story is to know something of the mountainous terrain of Washington County and the source of supply which comes from as near the "roof" of Virginia as is possible—namely, from nearly the top of famed White Top Mountain, to supply 5 towns in the rich limestone valley with freestone water. These are Abington, Glade Spring, Damascus and Emory, which combined in 1933 to set up the Sanitary and Water Supply District.

Apparently after the system had been in service for 3 months the effects of water hammer began to be felt on this very much "up and down" 12-in. pipe line, as Mr. Vance described it. One after another lead joints began to blow and Mr. Vance was drafted from his job as a miller to take over repairs of the line. Once started there seemed to be no letting go. He described the line which at places dropped almost a sheer drop of 600 ft. The worse troubles were at the bends, of course. Here 1¼-in. iron tie rods were broken in two. trees 18 in. in diameter up-rooted and ground stripped 16 ft. down to bed rock. Since the latter proved to be a marl bed the land owner was repaid and no suit brought. In another spot 10 sq. ft. pieces of paving were lifted and thrown aside. To hold this particular bend (and others) it had taken an anchor block of 10 tons of concrete. In one case a joint blow cleaned out a whole kitchen. In the rough going 18 ft. length of 12-in. pipe "just plain broke in two—and there were plenty of these," added Mr. Vance.

Chapter II—Then when about caught up on joint blowouts came the cloud-bursts that played so much havoc in Southwest Va. last summer and creek crossings began going out before the boulders and timbers hurled against them so many times actually crushed the 12-in. pipe. Replacing and repairing these took diver technic and actually he himself

Homer Beckwith, The Pitometer Co., Pittsburgh, Pa. | *S. L. Williamson, City Engineer, Charlottesville, Va.* | *L. R. Caplan, Calgon, Inc., Philadelphia* | *W. W. Winfree, Glamorgan Pipe, Lynchburg, Va.* | *"Phil" Kavanagh, W. & T. Co., Roanoke, Va.* | *R. L. Blankenship, Dept. Public Wks., Richmond, Va.* | *"Fred" Dimmick, R. D. Wood Co., Richmond, Va.*

learned to stay under up to 2½ minutes at a time while the best could "take it" for 3½ minutes. It proved to be quite a contest amongst the younger men.

Then another side issue was the snakes encountered in the mountains, the top number killed in a single day being 17 rattlers and copperheads—the latter more treacherous than the first, and more feared by mountain people.

But, with it all, said the miller who "bit off a big chew," the people of the district are well pleased with the investment, the good soft mountain water; and, the project is paying its way. Without P.W.A. financing, however, it probably never would have happened.

"How Chemical Manufacturers Can Render Service to Small Water Works," was related by C. F. Bingham, District Sales Manager, Columbia Alkali Corp., Philadelphia, Pa.

Mr. Bingham, before entering the commercial field, was Sup't of Filtration at Richmond and Treasurer of the Va. Section. He began by saying that plant managers should take full advantage of the gratis technical services offered by most chemical manufacturers. In addition, chemical salesmen who hold jobs for any period of time must be sincere and most of them are technically trained. Nowadays, said Mr. Bingham, manufacturers and trade associations publish valuable technical booklets and brochures for free distribution that are really worth possessing and using. Trade associations are setting up standards and safe practices for the benefit of operators, and conducting research of value—particular reference being made to the work of The Chlorine Institute as an outstanding example of what can be accomplished in this direction.

To the operator the wideawake interested salesman brings "news of the field" and passes along information gained at other plants, meetings, etc., which may benefit the small operator in particular. In suggesting improvements in equipment or methods the salesman is usually thinking of the operator from the point of wishing him to get credit for making improvements or cutting operating costs. It may or may not be that his product will fit into the scheme. If so, so much the better for two individuals instead of one.

An important job of the salesman is to smooth out differences between the buyer and manufacturer and to do what is termed "complaint shooting." Mr. Bingham closed by saying that he had early learned as an operator that the technical suggestions of manufacturers' representatives had monetary value bordering on consulting practice which would not otherwise have been had, and there could be a worthwhile gain in cultivating every manufacturer's representative who has something to contribute aside from direct sales.

Cathodic Tank Protection

"Principles of Cathodic Tank Protection," by A. B. MacTaggart, Secy., Rusta-Restor Corp., Fremont, Ohio.

After presenting a brief explanation of the process of tank protection against internal corrosion by causing minute direct electric current flow from the water onto the tank walls to reproduce the electro-plating process and preclude ions of the metal from leaving the metal face, Mr. MacTaggart discussed the principles and basic factors of this modern method. He pointed out that the experimental stage had been passed when tank manufacturers accepted the process as the best overall tank protection measure available. In particular he made reference to the recent paper by J. O. Jackson, Chief Engr. of the Pittsburgh-Des Moines Steel Co., which appeared in the Sept., 1941, issue of the A.W.W.A. Journal as evidence of the acceptance of the electro-potential method as compared to protective points.

As a basic factor he pointed out that it was only necessary to maintain a positive charge on the interior tank surface, requiring not less than 0.3 amps. of current flow per minute for each square foot of surface requiring the protection.

Concerning conductivity of the water, this was another all important factor in designing the installation. A misconception was that pH value played an important role, but such was not the case within the range pH 6. to pH 9. Anodes, an important consideration, had been improved. The loss of carbon from carbon electrodes was infinitesmal; however, the newest electrode confined the carbon within a jacket of woven glass to preclude sloughing of carbon.

In discussing ice troubles, he referred to the new circuit developed for attaching anodic elements to the tank exterior and employing the half-wave alternating current, thus having no anodes within the tank at all. He would concede little if any value from the deposition of any material on the tank surface other than the protective hydrogen film, thus the method was as effective with distilled as with mineralized waters provided the necessary conductivity can be established in all instances.

"The Sterilization of Water Mains," by W. H. Shewbridge, Asst. Engr., Va. State Dept. of Health, Richmond, Va.

Mr. Shewbridge's paper, presented by H. W. Sindow in the author's absence, constituted a general discussion of water main sterilization practices and the needs for such. It was designed to open up discussion, which it did.

Richard Wagner (Lynchburg, Va.) reported using the procedure of placing dry hypochlorite in sections of the main and filling. Taking 3 applications to obtain satisfactory water, he didn't believe this method the right one to employ.

R. W. Fitzgerald (Norfolk, Va.) recited experiences at Norfolk which had led him to believe that no form of chlorination (gas or powder) could be depended upon to penetrate

the jute of the joints sufficiently. One main had been chlorinated every 10th day from May to Sept. without securing results of lasting satisfaction. Finally this main was taken up and re-laid with sterilized jute. After this one chlorination did the job and B-coli had not reappeared. On some jute 540 ppm. of chlorine had been required for good sterilization.

The Norfolk rule is now "No jute but sterilized jute," this meaning steam pressure applied for a full hour. In conjunction therewith no less than 1 week of contact with chlorinated water standing in the main is acceptable before cutting the main into service.

R. C. Bardwell (C. & O. Ry. System) said that he preferred caustic-soda to dry hypochlorites. His method is a double handful of flake caustic per length of 12-in. pipe and allowance of 24-hour contact after filling.

M. C. Smith (Richmond, Va.) stated that in Richmond they rather depended upon the high residual carried in the form of chloramines to do the job—and it apparently was doing it. However, the rule is to use powdered "H. T. H." or "Perchloron" in laying lines of 8-in. pipe and smaller. For the larger mains liquid chlorine is used. Only 24-hour contact is practiced when in a hurry—otherwise 3 days are allowed. However, Mr. Smith repeated that without the high residual in the supply he doubted that results would continue good when using the temporary contact and flush scheme.

D. R. Taylor (Roanoke, Va.) said that it was surprising what one might find in a newly laid main unless at the end of each day's run a plug be caulked into the bell of the last length laid and removed upon resumption. He emphasized that the plug actually be caulked in to preclude easy removal.

Experience at Norfolk, Va., with the new rubber rings substituted for jute had indicated that new mains should be sterilized just the same.

The Question Hour

(Major Richard Messer, Presiding)

Q. No. 1. *What is best substitute for copper tubing for service lines?*

It appeared that galvanized iron was being used by some and none had tried the new lead alloy tubing known as "Tubeloy," which Mr. Brush stated could be used wherever lead pipe can be used without danger to health from lead attack by the water. It was also pointed out that cement lined pipes of galvanized or black iron should be considered as a worthy service pipe, these cement lined pipes being obtainable on the market and giving a good account of themselves for corrosive waters.

Q. No. 2. *What is best method for keeping filters free of mud-balls?*

L. R. Howson, president of the Association, was asked to answer this question. He said that the modern surface wash schemes were the apparent answer. With the surface wash the bed is only expanded 15 to 20 per cent by simultaneous up-flow wash. The cost of equipping filters with surface wash runs to between $150 and $200 per mg. of plant capacity. At Milwaukee the surface lateral system involved use of 1¼-in. laterals on 36-in. centers and drilled with 3/32-in. holes at an angle. Wash of 2 gal./sq. ft./min. at the surface is doing a splendid job with a total of 20 to 24 gals. per sq. ft. for combined top and bottom wash the maximum required, without regard for changes in water temperature as is necessary without surface wash.

Q. No. 3. *What is the best indication that a filter needs washing?*

R. J. Leveque (Richmond), former Sup't of Filtration at Fredericksburg, Va., called upon to give the answer, stated that ordinarily loss of head was used as the indicator. However, it was safer practice to keep watch on the filter effluent and wash on the first signs of turbidity increase regardless of the head loss registered. Frequently filters will begin to pass some turbidity before they have run their full available loss of head.

Q. No. 4. *Please outline the advantages and disadvantages of chlorination.*

L. H. Enslow (New York) was requested to answer. He said that the chief advantage was that so well demonstrated at Richmond—namely, the advantge of being able to maintain a good chlorine residual in the distribution system without consumers being aware of the presence of chlorine. The technical reason is that of preserving aseptic conditions in sluggish flow portions of the system where so-called aftergrowths of bacteria develops and in using up oxygen produce putrefactive conditions in the slime accumulating in these sluggish portions. This condition makes for corrosion, tuberculation, odors, red water and black (sulphide) water which is only observed in warm weather when bacteria are multiplying. The carrying or residual chlorine into such areas was likened to preserving cold weather conditions when the organisms are few in numbers and inactive.

The advantage in another direction is the keeping down of bacterial growth in the jute of joints and the presence of residual chlorine to counteract any chance pollution of moderate proportions which may enter the mains through leaking cross connections, faulty plumbing, etc.

As to disadvantages, there may be one. When and if all residual chlorine disappears the added nitrogen (ammonia) has been known to stimulate growths of iron bacteria and other forms if the mains are seeded with such. In open tanks or reservoirs algae growth will be stimulated by the residual ammonia after the chlorine has gone. On the other hand, chloramine treatment has been effectively used to suppress algae growths, in which case it is necessary to insure effective displacement through the reservoir if exposed to sunlight.

Q. No. 5. *It has been stated that the hexametaphosphate "Calgon" will subdue corrosion and will also prevent iron in well waters from precipitating in the system or turning red in the consumers' homes. Is there any experience?*

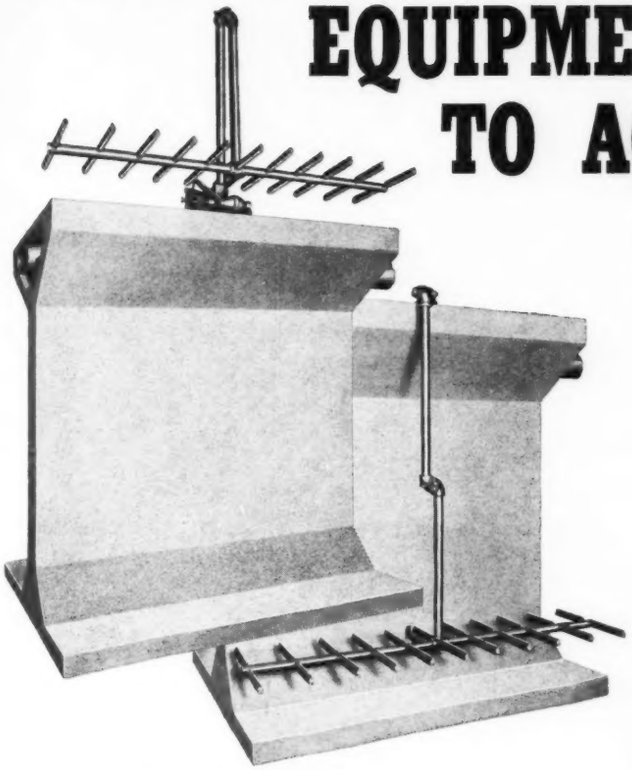
L. R. Caplan of Calgon, Inc., was asked to answer. He stated that in general 1 ppm. of Calgon for each ppm. of ferrous iron present would prevent oxidation and precipitation of iron. He cited cases of this sort at Sumter, S. C.; Canton, Ohio, Jamaica, L. I., and somewhere in Massachusetts. The dosage of 0.3 to 1.8 ppm. of "Calgon" to the Jamaica, L. I., well water had been effective. To prevent color development in addition to preventing precipitation the ratio of "Calgon" to iron had best be more than 1 to 1, especially if the water is used in laundrying.

In reply to a question Mr. Caplan suggested that if the iron-bearing water is chlorinated the "Calgon" would prove more effective if added ahead of the chlorine. Mr. Caplan was then asked if "Calgon" would be effective without lime treatment also in preventing pick-up of iron in the Norton system where the water had a pH of 6.8 and alkalinity of only 5 parts total and 1 part free CO_2?

The reply was that at Garden City, L. I., where "Calgon" had proved effective in preventing iron pick-up in the mains, the pH was 5.4, the alkalinity 6, and CO_2 2.5 ppm. The treatment and also stopped copper attack and green staining of both fixtures. A similar instance was that of Winchester, Mass., with alkalinity of 16 parts and pH 5.6.

(Adjournment.)

WHAT "CHICAGO" AIR DIFFUSION EQUIPMENT CONTRIBUTES TO ACTIVATED SLUDGE



Swing Diffusers

Fig. 2911 (right) Operating position and Fig. 2914 (left) diffuser tubes raised to tank walk. Simple regulation of air supply for Tapered Aeration. Tube cleaning without dewatering tanks or interrupting operation. Over 450 units (7250 tubes) installed. Ask for Bulletin 175.

Wide band of air diffusion perpendicular to line of sewage flow is provided by elevated diffuser tubes. The wide band gives—

Greater contact volume of diffused air with tank liquor.

Longer contact time of air bubbles in tank liquor.

Uniform spiral circulation with thorough mixing.

No unaerated center core.

Actual aeration period close to calculated detention, due to elimination of short circuiting.

Hydrostatic head for air pumpage decreased 15 to 20 per cent by location of tubes.

Higher rate of air delivery per diffuser is obtained without coalescence due to the wiping action of liquor rising from beneath and between tubes.

The same rate of air delivery from each tube, regardless of standard permeability variations, is insured by control orifice.

Installation and removal of tubes is simple and quick.

Stationary Diffusers

Fig. 2907—"Chicago" Stationary Diffusers. Air main and tube holder combined in a single pipe provides maximum economy. Over 700 units (9400 tubes) installed. Ask for Bulletin 183.

121

SUCCESSFUL "CHICAGO" EQUIPPED ACTIVATED SLUDGE PLANTS SINCE 1936

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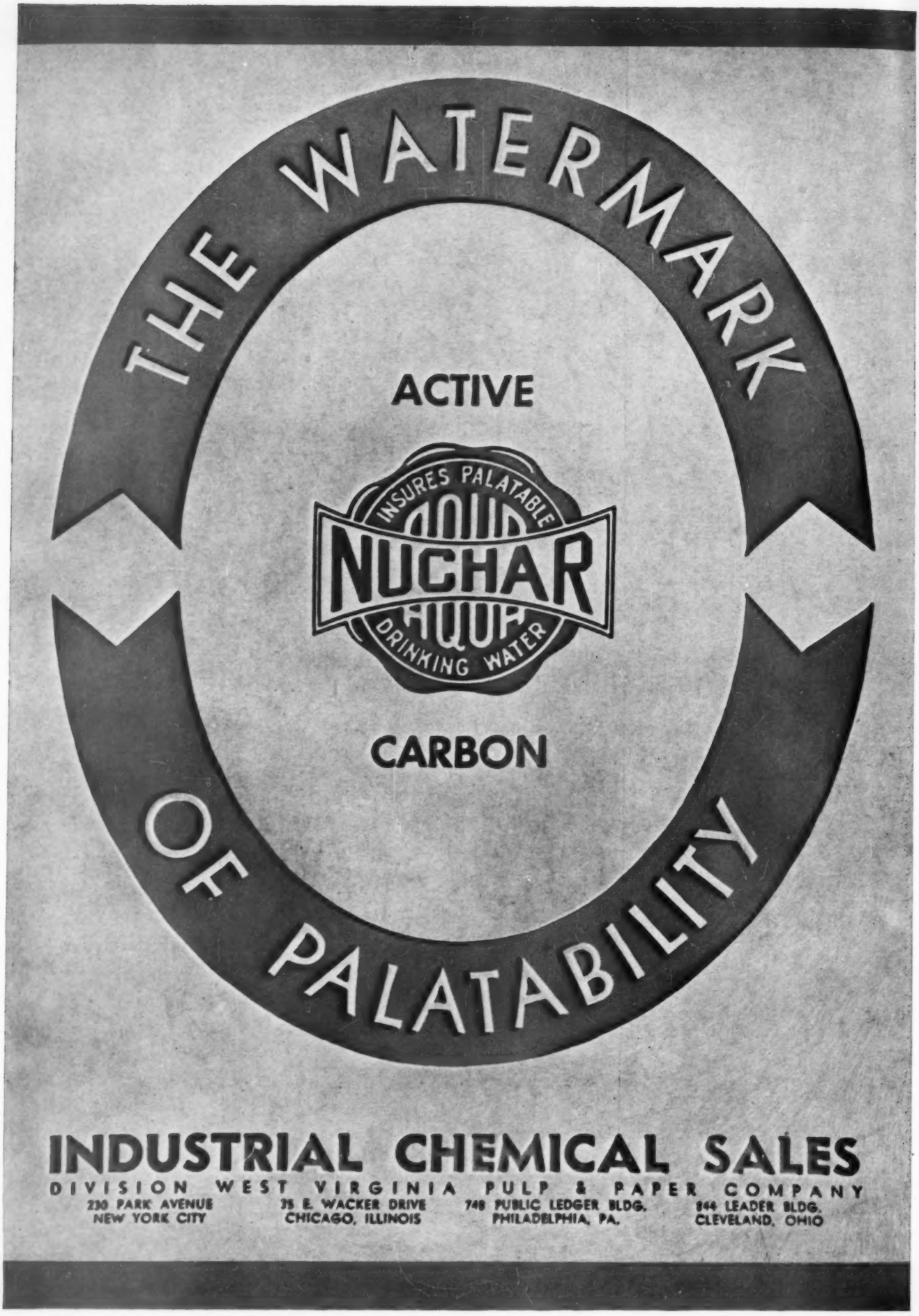
REPRESENTATIVES THROUGHOUT THE UNITED STATES AND FOREIGN COUNTRIES


THE WATERMARK
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INSURES PALATABLE
NUCHAR
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INDUSTRIAL CHEMICAL SALES
DIVISION WEST VIRGINIA PULP & PAPER COMPANY
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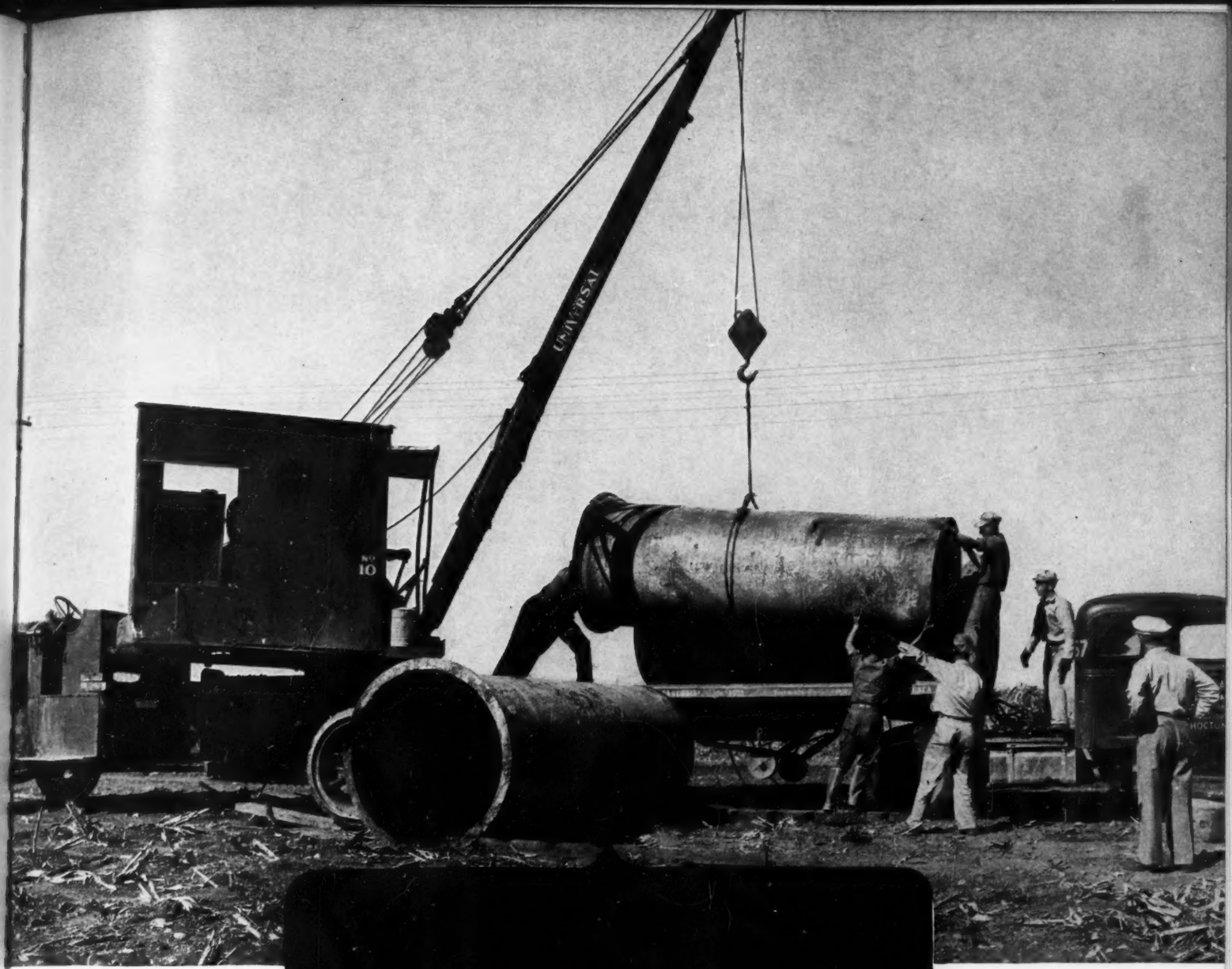


Loading salvaged 48-inch cast iron pipe on trucks at Columbus, Ohio. After 37 years service, without any maintenance cost, the pipe was taken up and sold by the city for substantial price per ton, over and above removal expense.

● Thirty-seven years ago the city officials of Columbus, Ohio, authorized the construction of a cast iron sewer force main more than a mile long and 4 feet in diameter. Since that time, 160 billion gallons had been pumped through this cast iron line without one cent of maintenance cost on the pipe.

Recently the city completed a new sewage treatment plant and large intercepting sewer, making the old main unnecessary for further duty. Since it was cast iron pipe, it was possible to salvage 1150 tons of material for either re-use or re-sale. The pipe was sold at a substantial price per ton, representing *an extra-dividend to the taxpayers* of Columbus.

It is impossible to foretell future requirements or population shifts in metropolitan cities but any public official can be sure that, when water or sewer mains must be abandoned or rerouted, the pipe can be salvaged or re-used, *if it is cast iron pipe.*

Pipe bearing this mark is cast iron pipe.

TRADE MARK REG.

Available in diameters from 1¼ to 84 inches.

CAST IRON PIPE RESEARCH ASSOCIATION, THOMAS F. WOLFE, RESEARCH ENGINEER, 1015 PEOPLES GAS BUILDING, CHICAGO, ILLINOIS

CAST IRON PIPE

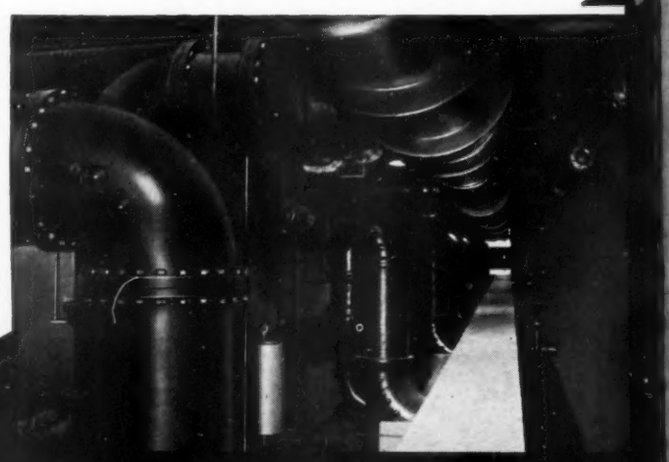
BARRANQUILLA ENLARGES!

—and again ROBERTS EQUIPMENT was the Choice!

The first unit of the Municipal Water Filtration Plant at Barranquilla, Colombia, was constructed in 1929. A capacity of eight million gallons per day was provided at that time. The original plant was Roberts equipped throughout. Steadily increasing consumption demanded an enlargement, and in 1941 the plant was extended to insure a continuous capacity of sixteen million gallons per day. Roberts equipment was again selected for the new filters.

The Operating Gallery—All functions of each filter are controlled from a Roberts Operating Table

Repeat orders carry special significance. Each succeeding contract is an expression of satisfaction and confidence. We are proud to have had a part in the enlargement of this very modern water purification plant.



MECHANICAL EQUIPMENT
BY
ROBERTS FILTER MFG. CO.
607 COLUMBIA AVE.
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This Name Plate is our pledge of cooperation — of adherence to specifications — of quality of materials — of excellence of workmanship — of continuing interest long after the contract price has been paid.

SOLILOQUY*

Otherwise a Bit of Hydraulics, Psychology, and Common Sense

By D. R. TAYLOR
Plant Superintendent
ROANOKE WATER DEPARTMENT
ROANOKE, VIRGINIA

IF WE were engaged to make a survey of the average water plant to make recommendations for efficient operation of that plant, we would undertake the job without any feeling of precociousness, because we are confident that the scientist who said that we did not know one-tenth of what our successors would know in another hundred years was right. One is reminded that we crawled up through our shirts for about two thousand years before someone had vision enough to split them down the front and sew buttons on them.

Whatever suggestions we would make would be prompted by a sincere effort to follow the precedent already established in the water works field, to pass along such observations and experiences that might be of some benefit in elevating the water works engineer to his rightful position in the order of things, and in an effort to assist our fellow superintendents toward more efficient operation.

Like a sound democracy, the efficient operation of any water department, or any other kind of business, for that matter, depends upon only two things—character and intelligence.

Organization Plans First

Based upon the correctness of this assumption, we would start with the organization. We would suggest an itinerary. If you were planning a tour of any extent, the most natural thing for you to do first would be to procure such maps and guides as you thought were necessary to enable you to select a route to follow that would take you where you wanted to go and enable you to arrive there when you thought you should.

An organization chart would be our first suggestion. Take a look at your entire organization on paper; then break it down into departments and list the duties of each individual, and we feel sure that you will immediately notice some inequalities, some congestion at some places, and

"Doc" Taylor

some scant spots at others. This is a mighty good way of locating your "bottlenecks." Then you may realize the need of some reorganization. Such a need is quite prevalent in many water plants.

This is a matter that one often realizes and observes with trepidation, and, yet, postpones with growing concern. It is like shaving—the longer one puts it off, the harder it is to do. Take our word for it—it is a difficult thing to do at any time, but surely this is no time to vacillate or procrastinate; it is easier to do it now than it will be later on.

Your personnel should be carefully studied and misfits shifted to positions more suitable to their equipment. Key positions should be adequately filled even if it is necessary to resort to some importation, even in the face of due realization that career men in the organization should be rewarded whenever possible.

What's Wrong With This Picture?

If nothing, are you declaring an "all-out" war on your slacker meters?

The Makings of Leadership

There has never been a time when leadership was at such a premium as it is today. Arthur W. Newcomb has said, "The character and qualifications of the leader are reflected in the men he selects, develops and gathers around him. Show me the leader and I will know his men. Show me the men and I will know their leader." Gentlemen, those are words of wisdom that we are sure no one will attempt to refute.

We would place *character* as first in importance. A man of high character is usually one who possesses some degree of personality, and between personality and intelligence we favor personality. An employe can be taught to be capable, but it is extremely difficult, even in a lifetime, to instill sufficient personality into one who came into this world without it. One modern day saying is, "It's not what you know that gets you ahead, it's who you know." There is another one that goes like this, "You had better be good to the people you meet on the way up because they are the same people that you will meet coming down." The last saying probably originated from those who lacked that intangible something called personality; who had become chagrined watching others pass them on the way up.

Next to character comes intelligence. The difference between a master leader and a master crook is that the leader has character and intelligence; the crook has only intelligence.

As the next requisite for our key men, we would stress general deportment. We would pick men with clear heads and level heads; men who were not inclined to become panicky in an emergency; men who were not inclined to brook or worry over actual or potential troubles; men who were capable of thinking things through. A clear mind is the usual result of a healthy body, and a healthy body and a clear mind usually denote efficiency.

We spent a few days on a farm

*The author, recently voted the Geo. W. Fuller Award by the Virginia Section, by invitation presented this paper before the New Jersey Section of the American Water Works Association. It is being reproduced by permission of the Association which also supplied the accompanying illustration.

one summer, far away from the beaten paths, where there was nothing to do but eat, sleep, and rest. One day we drove over to visit a neighboring farmer and "chew-the-fat" with him about nothing in particular. As we were leaving, we inquired casually, as a parting remark, if he thought it would rain. "Well," he said, "I guess it will; it always has." Now there is a fellow who will live forever. He has the greatest philosophy of life of all; he doesn't worry. We know that that farmer works from dawn 'til dark; that he is diligent, keen, alert, frugal, and successful; a pillar in his church, prominent in the affairs of his county, and respected by his friends and associates—that's the type, gentlemen, for the heads of your departments.

Employee Conferences On Public Relations

Organization is the major item. With the organization perfected, a group meeting of all employes should be held. At this meeting, stress should be laid upon intelligence—intelligence as exemplified by assiduous attention to details, honest effort, earnestness, judgment, cooperation, teamwork, loyalty, a sense of responsibility, and the proper perspective and co-ordination on the one side and the proper attitude in all dealings with customers on the other side.

We would stress the importance of building and conserving good public relations and go very thoroughly into minute details necessary for accomplishment along these lines, enumerating the importance of judgment and an even disposition, a thick skin, and the ability to swallow much and often, but with determination to stick to one's story. We would demonstrate to this group, if necessary, the proper and improper approach and procedure to be used in waiting on customers, selecting several typical types of complaints as examples. Most customers will be considerate if the employe will just let him tell his story *without being interrupted.* He probably has been thinking up what he has to say for a week, and he will feel much better if you will let him say it all and get it out of his system.

Occasionally one runs into a customer who insists on being just plain mean, like the golfer who was off his game and lost all of his bets and remarked that when he arrived home, if dinner wasn't ready, he was going to raise hell; and if dinner was ready, he wasn't going to eat a damned bite. Dealings with such a customer require a lot of swallowing and a lot of patience, but he can be worn down with the necessary perseverance.

It has been said that "The most precious thing anyone, man or store, or water department, if you please, can have is the friendship and the good will of others. It is something as fragile as an orchid and as beautiful; as precious as a gold nugget and as hard to find; as powerful as a great turbine and as hard to build; as wonderful as youth and as hard to keep."

Stressing public relations to your employes is like making love to an old maid—it can't be overdone. Good public relations can offset many deficiencies, but the best service in the world can fail in accomplishment if it is accompanied by poor public relations.

Does This Picture Apply to Your System?

If not, something should be done about it.

Records and Accounting

Now that the organization has been properly instructed as a group, let us look into the work of the various departments. We would start first with the auditing department and have it set up a system of accounts that would furnish complete information in the simplest manner—a system similar to the Uniform System of Accounting for Water Utilities promulgated by the State of Maine Public Utilities Commission. How can you determine whether you are progressing or retrograding without daily, monthly, and annual comparisons?

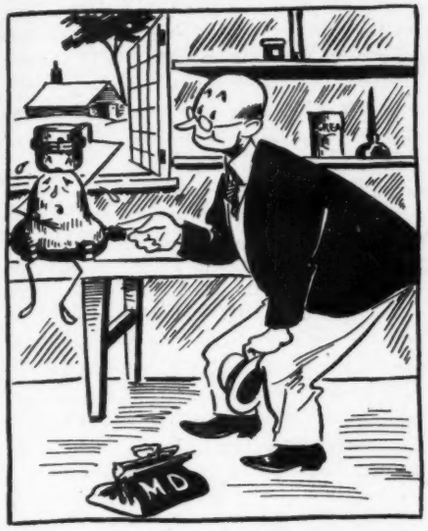
We would have a monthly statement prepared that, in addition to assets and liabilities and the usual accounting items, would show a monthly comparison of capital additions, maintenance and operating costs itemized for each division, and the corresponding figures for the same month one year prior. A comparison of these same items should also be shown between the total to date of the current year with that of the previous year. There should also be included a statistical sheet showing a similar comparison of physical quantities such as mains, valves, fire hydrants, active and inactive services, gain or loss in customers, gallons input, gallons sold and used for operations, unaccounted-for water, gallons of water produced per pound of coal, gallon of oil, per kilowatt hour, etc., and corresponding comparative figures for filter plant operations. There should be correlated with these records, on proper printed forms by all outside and inside departments, all details of operation. These should terminate in the accounting department and finally reach the proper record files. How do you know if you are installing mains or services cheaper this year than last? How do you know whether you are producing water for more or for less this year than you did last year? How can you know anything without an adequate accounting system?

Meterization Program

At the beginning of this preparation period, the duties of the engineering department would be manifold, probably requiring the addition of several temporary employes. We would start this department gathering information for the design of an efficient meter maintenance program, which on the outset would require the equipment of a good meter repair and testing shop, as well as portable testing equipment for use in the maintenance of large meters in the field. Also, proper test specifications should be prepared, stipulating allowable tolerances for all test rates for all types of meters.

This is a most important item, for you know that "as your meters go, so goes your revenue." This would be an opportune time to increase your revenue to help offset the extra expense of putting your house in order. We know of one water department that increased its annual revenue about four thousand dollars from large meters alone by the institution of a carefully designed comprehensive meter maintenance program, with an expenditure of not more than a thousand dollars, and it is believed that an equal increase was realized from small meters with a

corresponding relatively small increase in maintenance and operating expense. We know of cities that we honestly believe could increase their annual revenue from five to ten thousand dollars with an increase in operating expenses of actually not over two thousand dollars.



Sometimes He Has Trouble With His Little Insides

So bring him in for a fitness check-up before he is reported "dead."

With the aid of test meters and recorders, sufficient information should be obtained to indicate rather conclusively, with respect to small meters, the average percentage of under-registration and the percentage used at various rates. With this information, an average economical service life of small meters should be selected. By service life is meant the length of time a meter should be allowed to stay in service before it is removed for test. The actual determination of this service life can only be done by a cut and try method, but by a comparison of the cost of repairs with the revenue lost during the period in question, a proper economic limit of meter maintenance can be definitely determined after a few test periods of meters of various service lives.

Coincidental with the preparations already mentioned, we would engage a reputable firm to make a waste survey and a distribution study, at the end of which we would determine, depending upon the results, the size and age of the plant and the condition of its facilities, whether we would purchase the necessary equipment and make an annual check ourselves, or whether it would be more economical to have the work done by contract periodically every so many years, determined, of course, by the percentage of unaccounted for water shown by properly kept records.

And, Watch Your "C" Line

We would be particularly interested in velocities and friction coefficients of principal mains and would spot check these mains annually, if necessary, to observe any changes in these coefficients. In other words, it pays to watch your "C" line.

This information is useful in many ways, among which are the following: The "C" line trend will indicate the annual rate of decrease of carrying capacity of your mains, cognizance of which should be taken in the design of future extensions and main cleaning programs and rehabilitation work. These figures would indicate necessity for corrosion control. If corrosion control were already in use, these figures would determine its success, the advisability of changes of dosages, or even methods of treatment.

Pump Tests and Leakage Surveys

During this survey, all pumps should be tested and a thorough investigation should be made of the metering equipment at each source of supply. It would be recommended that each of these meters be overhauled and tested, and any found unreliable be replaced with modern measuring instruments. It is absolutely impossible to determine quantity of unaccounted-for water without accurate meters, and a plant operating without an accurate record of unaccounted-for water is similar to a grocery store operating without taking inventory, using a cash register or a bank deposit book. May we interject another thought here? In many instances, the only datum for determining an accurate figure for unaccounted-for water is a waste survey. How do you know that your figure of 25 per cent is good? You may have a 500,000 gallon per day leak and your figure maybe should be 15 per cent instead of 25 per cent. This survey is another good chance to secure a net increase in revenue to help pay for the transformation.

In this connection, a program should be adopted for testing all pumps at least annually. A pump bought last year with an efficiency of 75 per cent may, due to a change of conditions, have an efficiency of only 40 per cent this year. You may be losing ten dollars per day when a new impeller (costing only twenty dollars, perhaps) would be paid for in a few days. On the other hand, you may have a pump which runs intermittently, we will say, a total of six hours per day, pumping to an elevated tank against a high friction head. A test of this pump might prove that you could well afford to replace it with a pump of a lower capacity, with a corresponding lower friction head, and save a large amount on power costs, even though it is necessary to run it a greater number of hours per day.

We know of a case where a pump with a capacity of 700 gallons per minute was producing a friction head of ninety feet. This pump was supplying an elevated tank and was run only six hours per day. A test of this pump indicated that a 250 gallon per minute pump, which would run almost three times as long each day, would, due to a great reduction in friction head (easily determined with one of the conversions of the Hazen and Williams formula), save about seventy-five dollars per month on power costs. The change was made and the anticipated savings realized. The old pump was left intact for standby use.

There's Something Too One-Sided in This Kind of Spending

But it too frequently prevails.

A 10-Year Program

After this survey was completed, we would, with the aid of its findings and the latest recommendations of the National Board of Fire Underwriters, prepare a ten or fifteen-year construction program. This being an important major item and one in which large amounts of money can be easily and unwisely spent, we would not hesitate to secure the services of the best consulting engineers with experience in this particular phase to assist in the preparation and design of this program. Such a program is vastly important because by adherence to such a program much duplication of effort and ex-

pense can be avoided. For instance, suppose the program called for a twenty-inch header across one end of your city in five years, and in the meantime ordinary growth required an eight-inch extension for, we will say, a thousand feet along a portion of the route of the proposed twenty-inch main. It would, of course, be the better part of wisdom to lay this thousand feet with twenty-inch pipe now.

A Physical Inventory

Along with its other work, we would recommend that the engineering department begin the compilation of a complete physical inventory of the entire plant with proper maps and records, showing on these maps and records the date of each installation so far as all previous records show and old employes could remember. With these figures, a perpetual inventory of all facilities could be started and kept up to date monthly. These records would become increasingly valuable, not only for determining the real capital value of the plant but also in the determination of proper figures for the service life of facilities and equipment and depreciation and obsolescence.

We would suggest that an annual valve and fire hydrant inspection program be adopted. To some initiates in the water works field, this is something with intangible aspects, but those with experience know that the value obtained is well worth the price.

Standardization

Proper specifications and blueprints of standard construction should be prepared and followed. Standardization of two or not over three different makes of valves, fire hydrants, meters, etc., will also serve to keep your stock of materials and supplies low, and alleviate lost time, confusion, and extra and unnecessary expense.

Another important item is that of miscellaneous equipment such as flow recorders, pitot tubes, manometers, pipe locaters, leak locaters, gauges, etc. Good equipment stimulates pride in your employes and makes for efficient operation. Don't overlook the value of such a good investment.

The Superintendent

Our final recommendation is the most important one. So far the major part of our theme has been character—character of organization, of personnel, facilities, equipment, engineering, operation, procedure, and

This Lady Is Well Worth Courting

And with the right sort of organization can be won.

policies. For effective results, this character must be accompanied by intelligence. What about your superintendent, chief engineer, or whatever you may call him? The fountain head of the intelligence of any organization is in the man who directs its affairs. It is from this source that wisdom, judgment, enthusiasm, and incentive emanates, diffuses, and permeates the entire organization. The influence of proper leadership is catalytic in its action. It can be used over and over without wearing out. Remember, "Show me the men and I will know their leader."

For those few plants that, like Topsy, have "just growed" and are not already blessed with a capable, technically trained superintendent or chief engineer, we would strongly urge that the investment be made.

If your plant falls in that category of having a capable, commendable and loyal head, of many years' service, whose burdens have been gradually increased from year to year to a disproportionate but maybe unrealized immensity, and yet you are disinclined to mention to him the advisability of giving him some well deserved assistance by the employment of another engineer, fearing that he might misunderstand your intentions or that his pride will be injured or his feelings hurt, then cease to worry. You are laboring under a misapprehension. He will welcome and appreciate such assistance if you employ the right sort of man. If the new man has "what it takes," he will win the confidence and respect of the entire organization and make you proud of this new addition to your organization. This is not fantastic; we have seen it done.

There are still a few water works executives who will willingly spend many thousands of dollars per year for main extension for a return of only six per cent on the investment who cannot see the wisdom of paying the necessary amount to secure a capable engineer who could probably effect a return of 50 to 100 per cent on the investment.

The program that we have suggested is not idealistic—such a program is being followed in many successful plants—nor is it difficult. It is just a matter of making a plan and following it, and the time required to get into full production can be controlled to meet your own particular conditions and to allow new practices to help pay their way.

We have obviously touched on only the major points. It is well understood, we are sure, that there are innumerable details requiring the proper attention from someone, all of which can be delegated to various individuals in the different departments. The master plan is the main thing; the details will prove simple.

In this connection we are reminded of the young graduate engineer engaged by a lumber company who considered how he would cut a tapering log in two pieces so that each piece would contain the same number of board-feet of lumber. With the aid of higher mathematics and several hours of effort, he finally arrived at the answer. Then, feeling rather cocky, he asked an old lumberjack how he would have done it. The old lumberjack said, "Well, I reckon I would have balanced that log on the edge of a board and sawed it off where it balanced." There are always more ways than one of doing most anything. The hardest part of the job is usually getting started.

Again—Employee Conferences

For the next to the last parting reminder, we would again mention that group meetings should be held regularly, during which the group leader should assure himself that instructions and explanations are thoroughly understood by encouraging each employe to ask questions about anything that he is not sure of. Instructions are often misunderstood. They may be inadvertently worded so that more than one interpretation could be placed upon them. As a homely illustration, there was a man in a small town who met a friend walking down the street about dusk with a gun in his hand. He said, "My Lord, John, what are you doing?" The friend remarked, "I've

just shot a dog." This man said, "Was he mad?" His friend replied, "Well he wasn't any too well pleased." Don't be afraid to encourage them occasionally by some sort of recognition of a job well done, a pat on the back or a word of commendation, and show your approval straight from the shoulder. Don't attempt to let a left-handed gesture suffice. This costs nothing, and the returns are large.

Character and intelligence, gentlemen, that's all it takes. With an organization with these two attributes, there is no such thing as failure. Above all things, Mr. Head of a Water Department, try to be an inspiring leader. An employe will overlook your mistakes if you are a good fellow, but he will never forgive you for any type of unfairness. Be careful and never let an employe down and he will rarely, if ever, let you down. One of the greatest sermons that we have ever read, applicable to employer and employe alike, is the following poem by Tom Fox entitled,

"Who Best Can Work"

"God bless those good old faithful chaps
With happy smiles upon their maps.
Whenever asked to take a job,
You never hear them squawk or sob.
Right here a phrase comes back to me,
'Who best can work and best agree.'

"To me, at least, it would appear
Two kinds of folks run this old sphere,
The birds who smile and do the work
And those who crab and stall and shirk.
That's why I say, 'God bless the guy
On whom you always can rely.'

"No matter what his faults may be,
He'll always stand ace high with me;
And he will crash those Pearly Gates.
Not only that, I'll bet he rates
A bright and shiny golden crown
This guy who never lets you down."

WATER AND SEWAGE PATENTS

(Of Recent Issue)

Reported by
JULIAN F. SMITH*

Water Patents

Water Softener. Kendall Clark (to Milner Corp.). U. S. 2,265,225, Dec. 9. In apparatus for softening water a reagent tank and a regenerator tank are placed side by side and water is fed to each in proportioned amounts under control of a valve system comprising a needle valve and a disk valve.

Water Softener. E. E. Eickmeyer and A. G. Horvath (to Dayton Pump and Mfg. Co.). U. S. 2,265,520, Dec. 9. In water softening apparatus having a reagent tank and a brine tank a rotor bearing flow passages is revolved in such a way as to open passage successively for softening, reagent backwashing with simultaneous brine tank refilling, regenerating with simultaneous brine tank discharge, and washing brine from the reagent.

Aggressive Waters. O. M. Urbain and W. R. Stemen (to Chas. H. Lewis). U. S. 2,265,585, Dec. 9. Purifying aggressive waters by cation exchange in contact with a water-insoluble polybasic acid ester of a polyhydroxy compound having available cations.

Water Purification. R. B. Morse (to Carrie E. Morse, administratrix, and Katherine B. M. Devereux). U. S. 2,265,741, Dec. 9. Filtering water through a graduated gravel bed supported on a wire screen and covered with sand.

Flocculating Unit. S. L. Tolman (to Jeffrey Mfg. Co.). U. S. 2,266,-097, Dec. 16. Clarifying a liquid by flocculation in successive stages in a flocculator in which the liquid, in each stage, is given a circular motion around a horizontal axis.

Sewage Patents

Industrial Wastes. R. W. Shafer (to Dorr Co., Inc.). U. S. 2,266,386, Dec. 16. A continuous closed circuit purification system has a settling reservoir, a biological oxidizing bed and a discharge duct for passing liquid from the oxidizing bed to the settling reservoir.

Grit Remover and Washer. M. B. Tark (to Link-Belt Co.). U. S. 2,-266,937, Dec. 23. Sewage or industrial waste containing grit and putrescible organic matter is passed slowly through a settling basin and the settled grit is stirred and moved in counter-current flow to the incoming sewage to wash away the putrescible matter and return it to the settling zone while the grit is removed.

Sewage Treatment Apparatus. R. E. Briggs (to Jeffrey Mfg. Co.). U. S. 2,267,438, Dec. 23. A device having rotary driving and driven units, each with a disk, and power limiting means causing the disks to rotate together excepting when overloaded.

Sewer Cleaner. Edward Clotz. U. S. 2,267,493, Dec. 23. A rotatable reel carrying a snake-like coil, and a curved rotatable guide tube for whirling the unreeled portion of the coil within a sewer.

Sedimentation. C. G. Hawley (to Hawley Engineering Corp.). U. S. 2,267,608, Dec. 23. An elongated gravity settling tank has a sewage inlet at one end and a sludge discharge at the other, with nozzles at intervals in the bottom of the tank to supply pressure water which sweeps the sludge toward the discharge outlet.

*Associate Director, Hooker, Scientific Library, Central College, Fayette, Mo.

MEETING OF THE NORTH CAROLINA SECTION OF A.W.W.A. AND THE N. C. SEWAGE WORKS ASS'N

ON November 3, 4 and 5 the North Carolina Section of A.W.W.A. and the sister North Carolina Sewage Works Association held their customary Joint Annual Meeting in High Point, N. C., with a registered attendance of 240.

Chairmen

A. O. True
Sanitary Engr.
Greensboro, N. C.
(Retiring)

D. M. Williams
Supt. Water & Sw.
Durham, N. C.
(Incoming)

On the forenoon prior to the official opening of the meeting an examination was held for water plant operators seeking certification in the "B" and "C" grades as set up by the N. C. Water Operators Association. At the close of the meeting 47 certificates were delivered to operators who had been successful in passing examinations held during the year, the certificates being distributed by Prof. Harold B. Gotaas of the Sanitary Engineering Dept. of the University of North Carolina. It should be explained that the N. C. Water Operators' Assn. fostered by the State Dept. of Health is affiliated with but not a part of the N. C. Section of A.W.W.A.

In the afternoon inspection trips were made to the Water Purification and Sewage Treatment Plants of High Point and likewise to one of the leading furniture manufacturing plants for which High Point is famed.

Entertainment

Following the inspection tours the City of High Point was host at a Barbecue Supper served in the local Armory.

On the second day an Honorary Luncheon was tendered visiting officials of A.W.W.A. and the Sewage Works Federation at which the principal speaker was Arthur S. Bedell, President of the Sewage Works Federation. Mr. Bedell in his excellently presented review, told of history and recent reorganization of the Federation of Sewage Works Association now composed of 27 individual associations and having a membership of 2800. He reviewed the policies and plans laid down for the Federation with most emphasis on an improved Journal from the plant operators' point of view and the committee work planned in the direction of standardization of operating practices and development of equipment specifications along the lines followed so successfully in A.W.W.A.

National Presidents
Louis R. Howson, A.W.W.A.
and
Arthur S. Bedell, Sewage Wks. Federation

The Annual Dinner and Dance attended by 198 proved to be the best attended and most brilliant of any held by the Section for some years. Indication of this was best had by the fact that Jack Yancey's orchestra was repeatedly re-hired for another hour of dancing until grey dawn broke through.

Honor guest at the Dinner was High Point's witty Mayor Arthur Kirkman, who served as the toastmaster. The speaker of the evening was A.W.W.A.'s president, Louis R. Howson, who gave an illustrated account of his experiences in Alaska which he termed "An Engineer's Bird's Eye View of Alaska" that proved as interesting as it was instructive.

Honored Members

Wm. C. Olsen
Consulting Engr.
Raleigh, N. C.

Wm. E. Vest
Supt., Wtr. & Sew.
Charlotte, N. C.

Honors and Awards

Following the dinner three awards were made. To *Wm. C. Olsen*, Consulting Engineer of Raleigh, N. C., went the George W. Fuller Memorial Award made the more impressive by the splendid presentation speech made by Dr. H. G. Baity, Chairman of the Award Committee. Mr. Olsen was amongst other things cited "in recognition of his outstanding ability in the design of attractive and efficient plants, in particular the new filtration plant of Raleigh, N. C., as conspicuous example." A muchly flushed "Bill" Olsen accepted the award with a characteristically brief —"I feel highly honored. I thank you."

To *Wm. E. Vest*, the much beloved Superintendent of Water and Sewerage at Charlotte, N. C., who has in many ways served the Section, was made a special award. To him was presented a Life Membership in

the Section and Parent Association which award was presented by President Howson in behalf of the N. C. Section. Mr. Vest has been head of the Charlotte Water Works since 1910 and has seen its plant grow into a $6,000,000 property serving more than 100,000 people as against the 10,000 in Charlotte when he took charge 32 years ago.

To *Wm. M. Franklin*, Supt. of Water & Sewage Treatment at Charlotter, N. C., went the Moffitt Cup, which is awarded each year to that member securing the largest number of new members during the year. This cup donated by McKean Moffitt, Supt. of Water and Sewerage at Wilmington, N. C., will remain permanently in Mr. Franklin's possession in view of his having won it on three occasions. The presentation was made by L. I. Lassiter, Supt. of Filtration at Wilmington, in Mr. Moffitt's behalf.

National Directors

J. W. Kellogg
Director
State Lab. Hygiene
Raleigh, N. C.
(AWWA Director)

H. G. Baity
Dean of Engr'g
Univ. of N. Car.
Chapel Hill, N. C.
(Sewage Fed. Dir.)

Mr. Franklin, in accepting the cup, said that the cup was merely something for Mrs. Franklin to keep polished up. Although he had won it, "the *real* winners were those new members who would benefit through membership in the Association."

[Interesting is the fact that all three award winners are in this instance "Bills".—Ed.]

Officers for the Year Ensuing

Chairman

D. M. Williams, Supt. Water & Sewage, Durham, N. C.

Vice-Chairman

W. J. Parks, Supt. of Water, Asheville, N. C.

Secy.-Treas.

R. S. Phillips, Supt. Water Purification and Sewage Treatment, Durham, N. C.

Trustees

J. H. Henderlite, Ft. Bragg, N. C.
E. D. Burchard, Asheville, N. C.

To the Board of Directors of the Federation of Sewage Works Association Dr. H. G. Baity was named to succeed Wm. M. Piatt, whose term expires this year.

J. W. Kellogg's term as Director on the AW.W.A. Board continues until 1943.

W. M. Franklin was elected Chairman of the Nominating Committee. Choice of place for the 1943 meeting was left in the hands of the Executive Committee.

Technical Sessions

(Chairman, A. O. True, Presiding)

The Technical Sessions were opened with a brief address by Mayor Kirkman of High Point, followed by a showing of the very excellently filmed color and sound movie describing the important "Stone Canyon Inlet-Outlet Line of the Water Supply System of Los Angeles" which had been arranged for by The Barrett Co. and was shown by T. F. Kelley of Barrett Co.'s Technical Service Dept.

Wheel-Horse Committeemen

H. B. Gotass, Prof. Sanitary Engineering
Univ. of N. C., Chapel Hill
(Program Chairman)

J. H. Henderlite, Chemist
Fort Bragg, N. C.
(Chairman Nominating Committee)

W. M. Franklin, Supt. of Plants
Charlotte, N. C.
(Chairman Membership Committee and Maffitt Cup Winner)

The Stone Canyon line is constructed of 60 in. steel pipe with ⅜ in. wall thickness and protected inside and out with coal tar enamel ⅛ in. thick. The line is valved completely with cone type valves of 36 in. size, on reduced sections, in concrete vaults with removable tops. The picture showing enamel lining and coating operations performed in Los Angeles Water Dept.'s own plant. It also showed fabrication of the pipe and its laying and the precision and care with which the cone valves were constructed and tested in the plant of S. Morgan Smith.

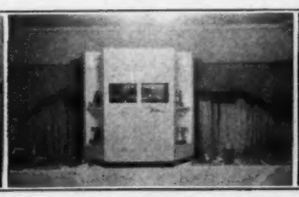
Host and Head

J. L. Perkins
Director
Public Utilities
High Point, N. C.

W. H. Booker
Chief Engr.
N. C. Dept. Health
Raleigh, N. C.

Before the presentation of papers got under way the Chairman introduced James L. Hales, State Director of Federal Works Projects, who outlined plans being made for a Public Works Construction Program being planned for the purpose of taking up defense workers after the present emergency is over and unemployment will once more be a problem. At present in the prospecting stage, already $5,000,000 in proposed useful public works construction had been turned in for North Carolina, said Mr. Hales. He explained that the reason for such advance planning was to have everything ready to go when the time arrived and in this direction to help forecast regarding manufacturing needs.

The only paper of the afternoon



Exhibits—In Part

Cities Supply Co.
Sumter, S. C.
(M. B. Randle)

Dresser Mfg. Co.
Bradford, Pa.

Pittsburgh-Natl. Meter
Pittsburgh, Pa.

Innis Speiden Co.
New York City

Stuart-Brumley Corp.
Baltimore, Md.
(Geo. A. Tippins)

session was that, preparatory to the plant inspection, by A. J. Setzer, Supt. of Water & Sewage Treatment Plants, who described the impounding reservoir on Deep River, the pumping station, 4 mi. long 12 to 24 in. force mains to the 750,000 g.p.d. filter-plant and the plant proper, which is of orthodox design with 8 filters and 2 in. C.I. perforated underdrains. Chloramination is practiced continuously and carbon is applied at the filters when required.

"Cold Water Coagulation Experiences at Durham, N. C." by J. R. Malone, Chemist, Durham (N. C.) Water Dept.

Mr. Malone's paper noted difficulties at the Durham plant in securing good coagulation with filter alum, resulting in shortened filter runs and need for watching for turbidity passing the beds at or about 8 ft. head loss during winter or the cold water operation period. Experimental work had disclosed an advantage of longer mixing periods than the 6 minutes provided in the plant—a period of 15 minutes being a considerable advantage, whereas no further gains were noted from longer periods. Mr. Malone cited figures for summer and winter silica content of the new water as a possible explanation of the less satisfactory winter coagulation. Silica of 89 ppm. in August drops to 22 ppm. in winter.

In the discussion *A. O. True,* Sanitary Engr. Proximity Mfg. Co., pointed out that water saturated with air in winter will release air and possibly CO_2 in filters that have the surface sand clogged and air binding results in short filter runs. *Dr. H. G. Baity* pointed out that the winter vicosity of water is twice as high as that in summer and may in itself be partially responsible for greater head loss in passing the sand.

In reply to a question from *L. R. Howson* the sand at Durham is of 0.35 mm. effective size and has a uniformity coefficient of 1.6. Then Mr. Howson reported that the sand chosen for the new Chicago plant

Programmers

R. F. Hill, Jr., Prin. Asst. Engr.
N. C. Dept. of Health, Raleigh

A. J. Setzer, Supt. of Plants
Water Works and Sewerage, High Point

Guy R. Scott, Sr. San. Engr.
Tenn. Valley Authority, Sheffield, Ala.

was between 0.62 and 0.70 mm. size because of the 3 gals./sq. ft./min. filtration rate to be used normally and a 3½ gal. rate for 6 hours on peak days. With silicate treatment these rates and large grained sand had proved practical on a 1 mgd. experimental scale in Chicago's Experimental Station.

Industrial Water Requirements

(A Symposium)

Lead by A. S. Behrman, Chemical Director of International Filter Co., this 4 paper symposium on "Requirements of Industrial Waters" proved highly interesting and informative.

Mr. Behrman began by citing the generally excellent quality of the surface water supplies of North Carolina's more important cities. Taking 15 of these supplies the analyses revealed—

Alkalinity .....11 to 18 ppm.
Total Hardness ...10 to 20 ppm.
Silica .....10 to 16 ppm.
Iron .....0.2 to 0.8 ppm.

North Carolina's problems in water purification consisted of turbidity and color removal, taste and odor control, corrosivity suppression, but little or no softening.

Taking the bottled beverage industry as one of highest importance in the South generally, Mr. Behrman spent considerable time on water requirements of the soft drink industry. As a prime requirement palatability was considered even above complete clarity. To produce water of the highest grade the most successful procedure of the bottler comprises super chlorination followed by dechlorination through granular carbon filters. The scheme, which had supplanted ozonation previously the best known method, had been in use for 12 years. Residual chlorine of not less than 4 to 5 ppm. is more effectively removed by the carbon beds than the organic colloids which the super-chlorine dosage detroy. The chlorine produces some carbon-dioxide in being removed, the effluent is sparking and dependably freed of odors, taste, turbidity, color and iron in the combined chlorine oxidation and carbon absorption.

Alkalinity is next to palatability in importance to the bottler. High alkalinity destroys some of the fine flavors and bouquet of fruit beverages because of raising the pH value which is optimum between pH 2.7 and 3.5 as a rule. Maximum alkalinity should be 100 ppm., whereas bottlers prefer 60 or under. The favored method of lowering alkalinity is lime precipitation and recarbonation.

Colloids are great offenders in that flocculation and precipitation may take place within the bottle. Organic colloids are the chief offenders in this direction and also are responsible for foaming when filling bottles and loss of the CO_2 charge when precipitating later. The remedy for such conditions is superchlorination, coaglulation and sand filtration followed by the activated carbon purifier and constitutes the highest form of purification attainable. Regardless of the type of pre-treatment residual chlorine should be maintained to keep the carbon bed in top condition.

Bottle Soaker and rinse water should be soft to preclude film formation on the glass. Here zeolite softening may prove desirable but not in connection with process water.

Mr. Behrman also briefly discussed the requirements for pulp and paper processing water as being principally low in turbidity, color and iron. For the production of textiles nothing

Diners and Dancers

Carl W. Mengel, Dir.
Public Wks. & Service
Greensboro, N. C.
(Mrs. Mengel)

Waymon Smith
Supt. Water
Marshall Field Co.
Leaksville, N. C.
(Mrs. Smith)

Chas. H. Starling
Sales Engr.
International Filter Co.
Charlotte, N. C.
(Mrs. Starling)

James Norman, Jr.
Supt. Water & Sew'ge
Leaksville, N. C.
(Mrs. Norman)

Carl W. Smedberg
City Manager
Greensboro, N. C.
(Mrs. Smedberg)

Robt. S. Phillips, Supt. Water & Sew. Treat. Durham, N. C. (Mrs. Phillips)

G. F. Lane, Sales Eng. Johns-Manville Co. Ramseur, N. C. (Mrs. Lane)

L. L. Hedgepeth, Dir. Technical Service Penna. Salt Mfg. Co. (Mrs. "Hedge")

Howard Johnson Supt. Filtration Danville, Va. (Mrs. Johnson)

Chas. H. Becker Mgr. Sales R. D. Wood Co. Philadelphia (Mrs. Becker)

short of zero turbidity, color and hardness was satisfactory in bleaching, washing and dyeing.

Returning to super-chlorination effects Mr. Behrman stated that for the full benefits from super-chlorination in an alkaline medium, such as water softening, 2 hours was considered the minimum dependable contact period for complete reactions. On this account the hypochlorite or chlorine is applied with the softening chemicals.

"Water for Textile Production," by John L. Brown, Jr., Supt., of Filtration, The Cannon Mills, Kannapolis, N. C.

Mr. Brown specified the water quantity requirements to be 400 to 800 gals. per pound of raw cotton fabricated. As to quality more than 0.2 ppm. iron produced dull and darkened colors. Hardness produces streaks in colored goods and is absorbed by the cotton yarn or cloth in the Kier bail to form an insoluble soap which interferes also with bleaching and dyeing. The 9 mgd. filtration plant at Kannapolis employs alum and soda ash. Only a fraction of the output needs to be softened for process water.

At present the possibility of recovery and reuse of rinse waters from the bleachery is under study and it appears that 50% of the bleachery requirements may be recovered for reuse to effect savings in process chemicals, heat units, pumping and treatment.

"Water for Pulp and Paper Production" by Henry Seaman, Supt. of Filtration, The Champion Paper Co., Canton, N. C.

Mr. Seaman reported volume of water required for pulp production to be 40,000 gals./ton and for paper only 10,000 gals./ton, the uses being for washing, thinning and conveying pulp and paper stock. Some color in the water is acceptable, turbidity and iron is bad but hardness is not so objectionable except in production of the highest grades. The chief requirement is uniformity of supply.

Mr. Seaman said that more and more is the water reused since it has been so well demonstrated that chlorine or ammonia and chlorine can prevent the objectionable bacterial slimes from forming and injuring the quality of pulp or paper produced.

AWWA's Howsons and Harry
Louis R. Howson, President of AWWA, and Mrs. Howson of Hinsdale, Ill.

Harry E. Jordan, Exec. Secy., AWWA, Port Washington, Long Island

(Mrs. H. "just loved" North Carolina's mountains; Mr. H. the country ham and eggs; Harry liked both)

"Water for the Bottling Industry" by Dr. John H. Sharf, Chief Chemist, American Bottlers of Carbonated Beverages, Washington, D. C.

Dr. Sharf in a well prepared discussion noted that of the 15 billion bottles of carbonated beverages put out yearly in America, North Carolina alone produced 30%.

As to the desirables in water quality Dr. Sharf demonstrated what a minute quantity of turbidity will do in causing a bottled beverage to lose its charge of CO_2 and "go flat." The principal requirement is, therefore, a water of high clarity and one that will not produce nuclei upon standing, shaking vigorously or having its pH lowered by CO_2 or acid syrups. Waters with iron, manganese, residual alumina, high hardness, taste or odor are trouble making and require further treatment by the bottler. The newest filtration equipment is the plate and frame type filter which is more certain of good operation than a unit requiring back washing. He too was high in praise of the effectiveness of superchlorination and activated carbon dechlorinators for producing a consistently satisfactory bottling water.

In thanking Dr. Sharf for his clear elucidation, L. H. Enslow said that the problem of periodic foaming tumblers at bottling plants had perplexed many a water plant operator; and, had he heard Mr. Behrman and Dr. Sharf sooner he could have given questioners as to "why foaming?" a more intelligent answer.

Water Treatment Round Table

The period scheduled on the program for the "Round Table on Water Treatment" was completely taken up with a reading of the report of the A.W.W.A. Committee "Proposed Standards for Water Purification Plant Operation" and discussion of it.

As a matter of fact its reading took up all of the time allotted and since there were many who doubted the wisdom of passing upon such a report without a more careful study it was voted to have copies distributed and members requested to

J. L. Perkins Director of Utilities High Point (Mrs. Perkins)

E. C. Hubbard, Asst. Engr., and Mrs. M. M. Melvin N. C. Dept. of Health

Ethel Godwin, Raleigh W. F. McAulay Pittsburgh Meter Co. Lois Welborn, High Pt.

D. M. Williams Supt. Water & Sew. Durham, N. C. (Mrs. Williams)

F. A. Mutzberg Chf. Eng., Wat. & Sew. Fort Bragg, N. C. (Mrs. Mutzberg)

J. F. Strickland
Chemist
and
D. P. Clifford, Supt.
Water and Sewerage
Dunn, N. C.

John H. Sugg
Chief Operator
and
Palmer Rice
Filtration Plant
Durham, N. C.

E. M. Johnson
Supt. Water Works
and
A. B. Uzzle, Engr.
Water Dept.
Raleigh, N. C.

R. M. Rogers
Chief Chemist
Winston-Salem, N. C.
and
F. K. Burr, Sales Eng.
Monsanto Chem. Co.
Birmingham, Ala.

Hal F. Davis
District Manager
and
A. P. Rudder
Sales Engr.
Wallace & Tiernan Co.
Charlotte and
Greensboro, N. C.

forward their comments to a committee appointed to serve as a "clearing house." From the comments filed this committee will prepare a report for the benefit of the Water Works Practice Committee of A.W.W.A.

"The Maintenance of Elevated Tanks" by H. F. Stearns, Distr. Manager, Chicago Bridge and Iron Co., Birmingham, Ala.

Mr. Stearns introduced a letter of warning against certain unscrupolus parties soliciting cleaning and painting work on tanks that have induced some towns to spend large sums on repairs that were in truth unnecessary. One of the most common forms of getting paid for unnecessary work is that of placing in the contract an allowance (extra) per rivet for each rivet replaced. Mr. Stearns explained the folly of rivet replacement unless the tank was actually leaking, because otherwise 50 years of experience had shown that until actually leaking rivet replacements are not needed and in fact is a complete waste of money. And, he added, don't let the much flatter heads of rivets on the inside of tanks on the exterior fool you into thinking that corrosion was the cause or that weakening is indicated.

Mr. Stearns divided operators into the tank maintainers and the donothings. He suggested setting up a regular maintenance fund for tank maintenance and repairs and employing only experienced responsible contractors employing first class materials on such maintenance and repair. As to the frequency of painting, about every 5 years was sufficient, and he briefly discussed the advantages of cathodic protection because of its economy and the fact that with it tanks would not have to be removed from service. However, the inner wall surface above the flow line and the under side of the roof must be protected with paint, Mr. Stearns reminded.

Water a National Resource

"Water a Natural Resource," by Guy R. Scott, Senior Sanitary Engr., Tennessee Valley Authority, Sheffield, Alabama.

Mr. Scott in a scholarly and strongly applauded paper presented a picture of a stream undergoing pollution and self recovery as akin to the circulatory system of the human body. He discussed the practicability and decency of corrective measures to reduce the burdens upon water purification facilities. He decried the fact that treatment of industrial sewages had not kept apace with sanitary sewage treatment and discussed the law and machinery needed to accomplish more in this direction. The first should be broad in scope and the latter locallized in the nature of drainage area on River Boards comprising representatives (leaders) of industry and the State Health Authority, the Board employing a technical staff to conduct experiments and surveys and fix degrees of treatment requisite for the conditions existing and no more than that.

Mr. Scott high-lighted the pollution surveys of the T.V.A. in 7 states so far and the studies of 4 critical sections and tributories. In this work the T.V.A. appreciated the assistance rendered by State Health Depts. cooperating.

We agree with the comments of Dr. H. G. Baity who said that it was a pity that the applause to Mr. Scott's paper could not extend beyond the room and a pity that this paper could not be read by every legislator.

Sewage Treatment

"Intermittant Sand Filters for Sewage Treatment" by Robert H. Grady, Asst. Engr., N. C. Dept. of Conservation and Development, Raleigh, N. C.

Mr. Grady reported on studies conducted with the aim of reducing the cost of providing slow sand filters for the smaller treatment plants where this type of unit had many advantages. The experimental plant treated 20,000 gpd. on filters dosed at rates of 125,000 and 200,000 gpd./acre. The sand size and depth studies revealed that a small sand 0.2 mm. effective size in a 9 in. deep bed gave results superior to 30 in. beds of coarser sands. However the 0.2 mm. beds clogged too quickly—2 weeks.

In his summary the conclusions reached were that (1) sand of 0.3 mm. size and uniformity coefficient of 2 gave the best overall results; (2) nothing was to be gained with a bed deeper than 18 inches; (3) sand of 0.5 mm. size was too coarse.

G. E. Hughey, Jr.
City Chemist
and
A. Y. Alexander, Jr.
Chief Sewage Operator
Statesville, N. C.

"Bill" Rapp
Dist. Sales Mgr.
Mueller Brass, Atlanta
and
A. R. Murphy
Div. Mgr.
Wallace & Tiernan Co.
Knoxville, Tenn.

J. C. Martin, Supt.
Pub. Wks., Tarboro,
N. C., and
Martin Schwartz
Supt., Public Utilities
Greenville, N. C.

Guy F. Lane
Sales Engr.
Johns-Manville Co.
and
Howard McNeill
Dist. Mgr.
Johns-Manville Co.
Philadelphia

Robt. H. Grady, Engr.
N. C. Dept. of Conserv.
Raleigh, and
"Burt" Graham
Sales Engr.
Stuart-Brumley Corp.
Charlotte, N. C.

D. P. Clifford
Supt. of Water
Dunn, N. C.

C. C. Lanford
Supt. Public Wks.
Newton, N. C.

J. R. Malone, Chemist
Filtration Plant
Durham, N. C.

Thomas S. Price
Plant Operator
Hickory, N. C.

W. D. Bryan, Jr.
Supt. of Water
Tarboro, N. C.

Geo. S. Rawlins
Consulting Engr.
Charlotte, N. C.

C. W. Mengel, Director
Public Wks. & Service
Greensboro, N. C.

W. H. Booker, Director, Div. of Engineering, State Dept. of Health, said that the State was requiring that sand for slow sand sewage filters be washed in order to employ a smaller bed area and also to reduce weed growth.

A question was raised about grease and its effect on fine grained filters, especially at institutions. The reply was to install a good grease trap. This brought up another question—"What constitutes a *good* grease trap?" Mr. Grady passed that one over to Mr. Booker who said he didn't know what was a good grease trap, his idea being that the best grease trap was a sufficiently large settling tank.

Sewage Treatment Round Table

(W. M. Franklin, Presiding)

The first question raised was **"How best to treat textile wastes—sulphur dye and direct dye wastes in particular?"**

Prof. Gotaas (Univ. N. C.) referred to the Textile Foundation studies in which sulphur dyes are precipitated best with only a rapid flash mix and no long period flocculator. Most successful precipitation was had at low pH and the use of iron coagulants in preference to alum because the iron produces sulphide of iron.

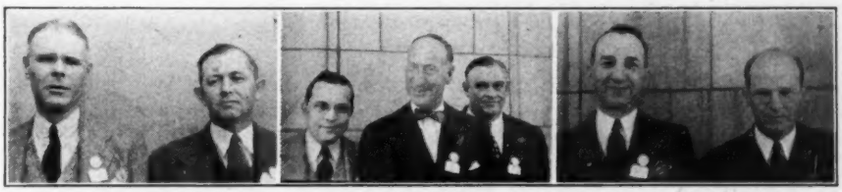
T. E. Witty, Supt. of Plants, Thomasville, Ga., stated that in his case lime had proved the least expensive coagulant for dye wastes. Alum is added also.

The next question was **"What is the Bio-Filtration scheme used at Ft. Bragg?**

J. H. Henderlite, Chemist, Ft. Bragg, called on to answer this one, said that the plant was designed for 6 mgd. with recirculation of filter effluent in the ratio of 3 return to 1 of settled sewage. The filters are only 3 ft. deep of 1½ in. to 3 in. stone and will receive a 30 mgd./acre application. Sludge from the final clarifiers is returned to flocculators ahead of the primary tanks.

The final question concerned **Methods of removing grease from textile wastes — sulphonated oils in particular?"**

L. H. Enslow was called to answer this question but could give no experience with the sulphonated oils. He surmised, however, that the same scheme of chlorination on aëro-chlorination used to break the emulsion of wool scouring wastes should prove more or less effective on the emulsified sulphonated oils. In this process the chlorine seems to destroy the emulsifying powers of proteins and amino compounds and the aeration is principally a means of efficient chlorine distribution and a frothing floatation effect combined. What the chlorine requirement would be could only be told by experimentation on the textile wastes in question.



W. McBingley, Sales Eng.
The Dorr Co.
Richmond, Va.
and
L. I. Lassiter, San. Engr.
City Dept. of Health
Wilmington, N. C.

W. B. Pebworth, Salesman
and
Walter A. Hersey, Pres.
Hersey Mfg. Co., Boston
and
John A. Diven, Dist. Mgr.
The Leadite Co.
Philadelphia

A. S. Behrman
Chemical Director
International Filter Co.
and
J. L. Brown, Supt.
Cannon Mills Water Plant
Kannapolis, N. C.

"Some Legal Aspects of Sewage Treatment" by Grover Jones, City Attorney, High Point, N. C.

Mr. Jones stating that municipalities in North Carolina can not be enjoined from polluting a stream by operation of a sewage treatment plant but the riparion owner can sue for damages suffered from such use or abuse of a stream. In this it has proved highly unfortunate that a jury must decide that injury exists or doesn't because invariably the experience has been that the expert witness and technical facts have little value to the defendant city in a jury trial. The property owner, who may never have seen the sewage plant, will be given the decision. Where there are a number of suits brought the best method, such as used in the High Point case, is to get the court to consolidate and refer cases to a referee. However, the land owner must be willing to accept this compromise.

Mr. Jones made a plea for more equitable treatment of municipalities actually ordered by the State to install treatment works and left standing up to be shot at by any or all who may be ready to take advantage of the situation and sue for monetary damages. Mr. Jones thought that a Board should be established to make impartial investigations of stream conditions and report to the court whether or not such conditions warranted bringing suit. Since plants have to be approved by the State Board of Health it sounded reasonable that this Board should be the agency to investigate and advise the court.

[In connection with Mr. Jones' comments it is interesting to learn that the Court has only very recently—since Mr. Jones' paper—awarded a judgment against High Point in 14 out of 37 cases tried. The claims were for damage to lands caused by odors from plant effluent emptied into Rich Fork Creek. The plant in question is an activated sludge plant.—Ed.]

NEW YORK SECTION A.W.W.A. HOLDS ANNUAL WINTER MEETING

Municipal Cooperation Reported in Mutual Aid Plan For Water Service in Case of Emergencies

By HARRY A. FABER
Associate Editor*

SUBJECTS of far-reaching importance filled the program of the New York State Section, A. W. W. A., at its annual winter meeting in New York City, December 30, 1941. An unexpected treat was provided, following the luncheon, by the reception and broadcasting over the hotel's public address system of Winston Churchill's stirring speech to the Canadian House of Commons in Ottawa. In the words of A. W. W. A. Secretary Jordan, no water works official should complain of his restrictions and difficulties after hearing of the sacrifices which Prime Minister Churchill pointed out as necessary to insure ultimate victory.

Before proceeding with its scheduled program, the Section approved a resolution commending highly the splendid work which Mr. Jordan has carried forward toward obtaining needed materials for water works operation. Greetings were brought from the California Section by L. J. Alexander, of the Southern California Water Co., a guest at the meeting. It was announced that the spring meeting of the New York Section will be held on April 30 and May 1.

Report of Progress on the Delaware Aqueduct

"Progress of the Delaware Aqueduct," by Leonard P. Wood, Designing Engineer, Board of Water Supply, City of New York.

By means of a comprehensive set of slides, Mr. Wood illustrated construction details of the impounding reservoirs and aqueducts in this important water system. Some eighty-five miles of tunnel excavation, the majority being concrete lined, has been completed.

Various contractors have devised and employed a wide diversity of methods, equipment, and special devices for carrying on concrete work inside the aqueduct. All tunnel lining is grouted to fill crevices, with the idea of making the rock itself as water tight as may be done. Steel lining and a concrete interlining has been provided where the aqueduct passes through bad ground.

The construction methods employed on the several dams and special compacting equipment used was of much interest. An aerator having over 3,500 nozzles is included in the system. Nearly completed is a coagulation plant which will be available to accomplish turbidity removal when that step is required. Some delay in the completion of this project, through national defense restrictions on materials, is anticipated.

Emergency Protective Methods Described

"Fire Fighting and Civilian Defence," by James W. Osterburg, New York Fire Department and Office of Civilian Defense.

Mr. Osterburg outlined the organization of the several units devised to function during air raids and discussed the characteristics of so-called chemical warfare gases. He recommended that water works employes should not join these civilian groups, since the technical training and specialized knowledge of such individuals make their services of far greater importance to the maintenance of uninterrupted water service. One of the functions of air raid wardens is to see that fire hydrants remain available at all times.

In commenting on gases which may be employed, the speaker said these often are actually liquids of low boiling point. Certain gases, such as Lewisite and Mustard, may persist in affected areas for three weeks to two months. Bleaching powder mixed with dirt is used as the neutralizing agent, but the decontamination squad must wear gas masks and protective clothing. Each square yard of the contaminated area requires one pound of bleaching powder and 2 pounds of dirt for neutralization of the gas. If proper equipment is available, a slurry of bleaching powder may be utilized.

Much other data of interest on war gases (classified as blistering, choking, arsenical, and tear gas types) was presented, but since little information of practical protective value seems yet to be available, it will not be reviewed.

Mr. Cox, State Department of Health, Albany, suggested that water works officials should take advantage of the assistance available from civilian defense agencies, rather than endeavor to be their own specialists.

Mr. Cranch, New Rochelle Water Department, described the serious depletion of pressure and dangerous fire situation which might be created by general withdrawal of water *after* an alarm has sounded, which is in accordance with instructions commonly issued. He advocated that publicity should be given to the necessity for filling pails and bath tubs with water *before and not during air raids.*

State-Wide Mutual Aid Plan Described

"New York State Mutual Aid Plan for Water Service in Case of Emergencies," by Anselmo F. Dappert, Principal Sanitary Engineer, State Department of Health, Albany, N. Y.

Mr. Dappert outlined the plan developed to maintain adequate, effective and safe water service under any possible emergency that may arise, either as a result of war or from natural causes, and to achieve this state of preparation with the least possible delay. Simple of statement, this objective has been forwarded rapidly but will require much further work on the part of local water officials before it is fully achieved. The plan was formulated by a committee appointed by the Mayor's Conference and State Department of Health, submitted to Governor Lehman and approved by him on October 14, 1941.

Each local water supply is expected to take definite steps and to apply certain measures but with varying emphasis dependent upon the particular local circumstances. For purposes of administration, the State has been divided into 23 zones, corresponding to existing state health districts (except for the metropolitan area). Outstanding local water officials or engineers have been appointed Zone Coordinators, with County Sanitary Engineers serving as Assistant Coordinators. It is the

*Research Chemist, The Chlorine Institute, Inc., New York, N. Y.

duty of Zone Coordinators to translate the various specific objectives of the plan into actual accomplishments.

The relationship between this plan and the work of local defense organizations should be one wherein the local water officials become an integral part of the local defense organization but are completely in charge of all water supply matters and of volunteer workers who may be assigned to emergency water duties.

Interconnection Program

According to the Mutual Aid Plan, the interconnection program will include elimination and prevention of dangerous cross connections. Interconnections between public water supplies and between municipal supplies and the *approved* supplies of industries or other *approved* supplies should be made to the fullest extent possible.

Throughout the State there are already about 100 such interconnections made between adjoining municipalities, water companies, and water districts. There are at least 200 more which are feasible, which can be made at moderate expense and which should be made as soon as possible.

Up to date maps of distribution systems and adequate detailed records of valve locations are essential to any plan designed to meet emergencies. It is one of the purposes of this plan to have such records brought up to date in each municipality of the State.

Local water authorities are being urged to cooperate closely with fire officials in regard to matters of mutual interest. Surveys of emergency sources of water and the provision of needed equipment is necessary. Location of fire hydrants and valves must be known; valves must be tested. Steps must be taken to correct weaknesses and bottlenecks to the fullest possible extent. Auxiliary power should immediately be provided where water works are dependent upon a single source of power. Special steps should be taken to supply adequate water service to defense industries.

Training of Personnel

An urgent need for experienced pipe layers, repair crews, etc., will follow any serious destruction of distribution systems. Regular water department employes should be trained for emergency duties, and reserve or volunteer workers should be organized and given some advance training. No specific data can be presented concerning the steps taken by local authorities to prevent sabotage, but appropriate action has generally been taken.

Inventory statistics will be available to all Zone Coordinators, who will act in supplying emergency requests for needed personnel, equipment or supplies. Excellent cooperation has been forthcoming from all local officials.

The outline of appropriate protective measures recommended is applicable to the best interests of municipalities everywhere and is worthy of consideration by all officials: (1) Protect water supplies. (2) Reinforce or correct weaknesses in the supplies and in distributing systems. (3) Bring operating efficiency to the highest possible level. (4) Make specific plans for the handling of emergency situations. (5) Cooperate in mutual aid arrangements whereby any community in distress may be supplied promptly from adjoining or neighboring communities.

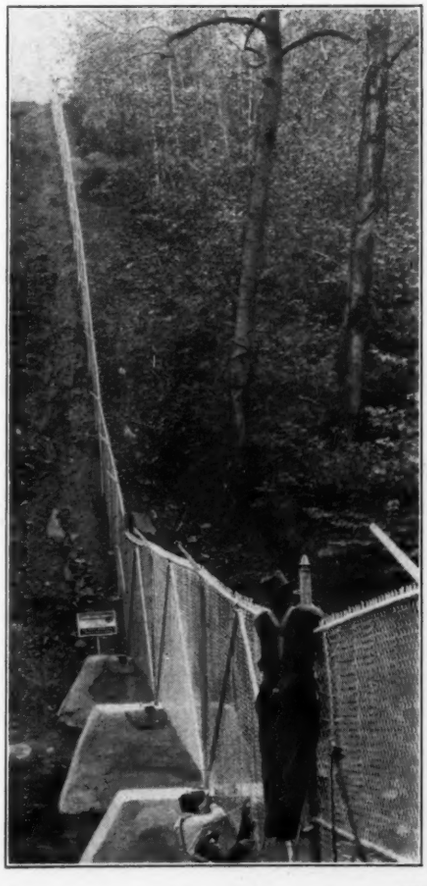
Washington's Water Supply Protected with Steel Fence

A strong wire fence, nine feet high, to surround the vital parts of the District of Columbia's water supply system for protection against any attempt at sabotage, is being erected.

Under the sponsorship of the U. S. Corps of Engineers, upon which rests the responsibility of furnishing and maintaining Washington's water supply, about 130 WPA workmen are putting up more than nine miles of chain link fense, around six reservoir areas, several pump stations, valve controls and exposed conduits.

The main fence is seven feet high, of No. 6 gauge chain link wire, strung on steel posts set in concrete. Along the top are three strands of barbed wire two feet high. All the wire used is of sufficient hardness to resist any cutting action except by the largest tools. The fense will be patrolled by special police.

The largest area fenced is the Dalecarlia reservoir, a large tract where raw water is stored. This required 25,166 linear feet of wire. McMillan reservoir, in another part of the city, will require 9,380 feet. Georgetown reservoir, where is located the filtration plant and settling basins, required 7,090 feet. Smaller reservoirs, various pump stations, towers and exposed valve controls will require sufficient wire to bring the total to 50,500 feet.



The total cost of the fence is estimated to be about $120,000.

CLEMENS BLANK PASSES

Served Indianapolis Water Co. for 44 Years.

Clemens Blank, Supt. of the Dept. of Construction and Maintenance of the Indianapolis Water Co., died on Dec. 27th at his home following an illness of several months. He was 66 years old.

Mr. Blank, who came to the Indianapolis Water Co. in 1897, when the office working force numbered four employees, and Mr. Blank was the all-round handy man, had completed 44 years of service with the company.

BEFORE STARTING A SMALL SEWAGE WORKS

BERNARD ROWNTREE
Manager
CARMEL SANITARY DISTRICT
CARMEL, CALIFORNIA

THE designing or consulting engineer, the city engineer or council, or the superintendent of a large sewage works need not waste time reading this, as there will be plenty of salesmen and manufacturers' representatives around all the time to see that nothing is forgotten in connection with equipment and tools for the more important plants.

This is written to help the city engineer or the operator of a small works who is on his own after the designing engineer and the various suppliers of equipment have packed their bags and departed for the big city.

A Word to the Man of No Experience

This is written especially for the man who has had no previous experience in the operation of a sewage works.

First of all he cannot be urged too strongly to obtain all the necessary information *before* starting the works and *before* the men have left who *should* know the answers.

Of equal importance is insisting that the various suppliers of equipment and the designing engineer put in writing *all* the information needed. There are so many items, some of which you will want to refer to months later, that it is extremely unwise to try or expect to remember all that you have been told by these gentlemen.

Items Not to Overlook

First, be sure you have a good set of *all* the drawings used in the construction of your works.

Second, get several loose leaf binders of letterhead size, 8½ by 11, a paper punch, and a supply of index sheets and blank loose leaf sheets.

The advantage of loose leaf binders is the ease of inserting additional material and of rearranging the divisions as best suits your needs.

Third, have all suppliers of equipment furnish catalogs and printed instruction books covering the equipment you have at your works.

Fourth, have all suppliers of equipment furnish *written* instructions regarding the operation, care and lubrication of their equipment.

In addition to the foregoing, it is highly advisable for you to:

1. Join your state or regional sewage works association.
2. Establish relations with your state board of health.
3. Purchase one or more good books on sewage treatment.
4. Subscribe to those magazines specializing on sewage treatment.
5. Prepare a properly indexed file of catalogs covering all tools, materials and supplies you may need.

As a starter, the loose leaf divisions in our binders were arranged as follows:

1. Chlorinator.
2. Clarifier and digester machinery.
3. Hot water system (for heating digester).
4. Gas system.
5. Fresh water system (driven well, pump, tank, etc.)
6. Electrical data.
7. Sewage flow meter system.
8. Painting.
9. Pumping stations.
10. Lubrication.

In addition to the catalog and the loose leaf binders, there are other subjects that should be included in your list of "must do" items. And start to gather the data before starting the works. You cannot start too soon to collect all the information you are going to need, and don't think you won't need it.

Other Matters of Importance

You may think of other subjects, but the following are important. These are: insurance, materials, planting, tools and sludge.

As an operator, you may not feel that it is your duty to your city to suggest what insurance should be obtained but your city council or city manager will appreciate your interest.

Probably you do not feel you know anything about insurance. The chances are your city council does not. If there is an insurance agents' association in your city, ask them to make a survey and suggestions. Or ask two or three agents to cooperate.

Your city may have workmen's compensation, public liability, property damage. Other protection is afforded by fire, explosion, earthquake and other coverages.

As to materials, find out what you will need and where it can be purchased. Such as lubricating oils, greases, packings, chlorine, waste or rags, paper towels, toilet paper, lamps, etc.

Regarding tools, decide what you are going to do and how you are going to do it. Get a general catalog of tools.

When you are considering planting or the beautification of the grounds, consider the results desired and work involved. If it is a lawn you want, don't forget the time required to water and mow it. Shall it be shrubs or trees, and if trees, what about dead leaves? Are evergreens better?

Last, but not least, call on your State Dept. of Health for their assistance and recommendations right at the outset and don't wait until you have troubles.

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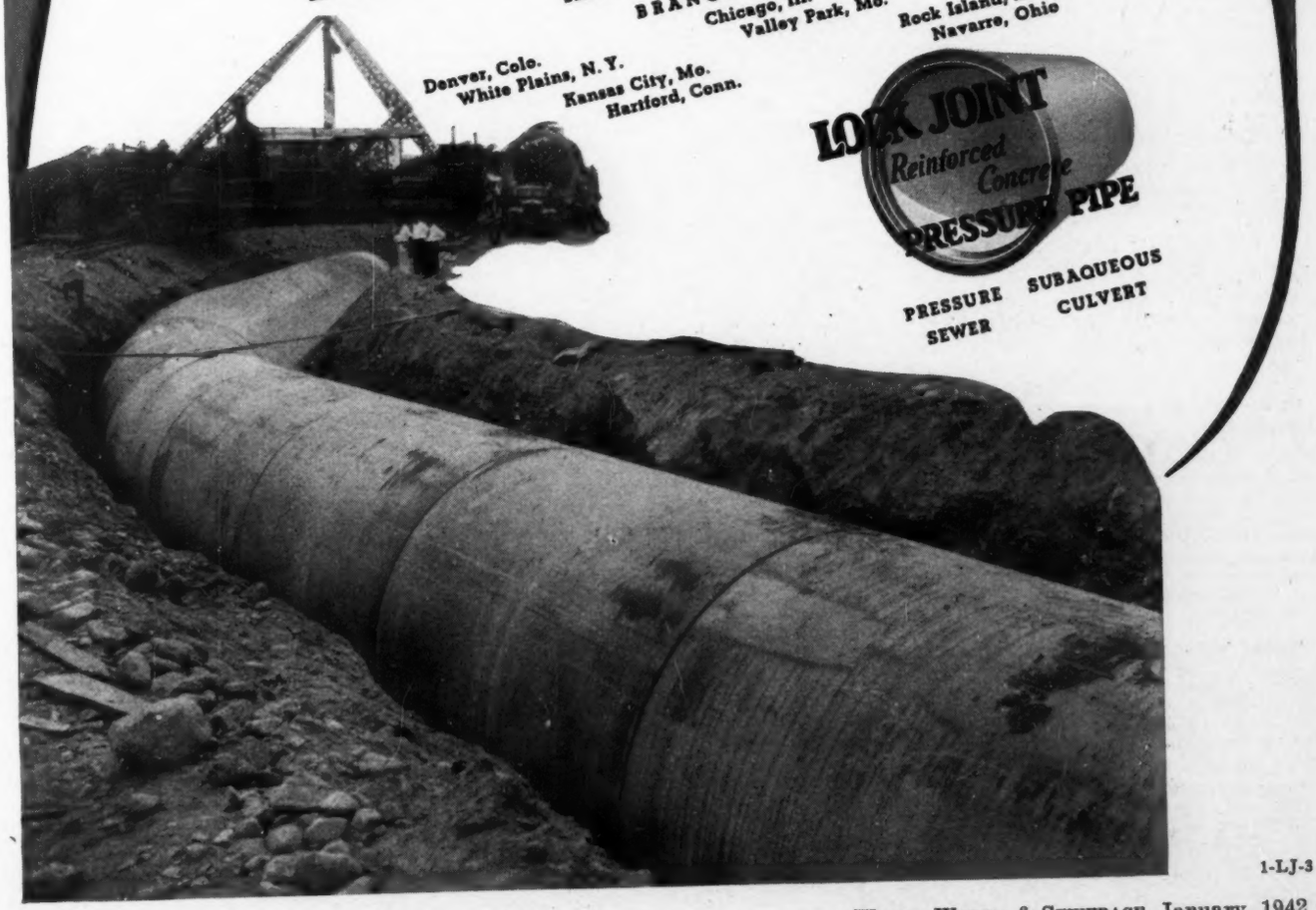

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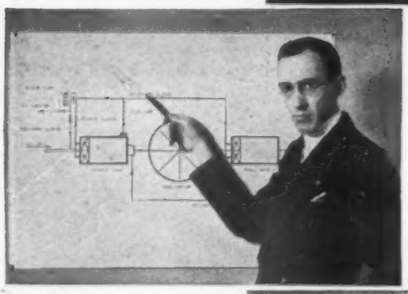

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50TH ANNIVERSARY 1891 REX 1941 CHAIN BELT COMPANY

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MEETINGS SCHEDULED

Jan. 15—BOSTON, MASS. (Hotel Statler)

New England Water Works Association. Secretary, F. J. Gifford, 613 Statler Bldg., Boston, Mass. (Next Meeting Feb. 19th.)

Jan. 19-23—STILLWATER, OKLA. (A. & M. College)

Oklahoma Water & Sewage Short Course. (18th Annual Session.) Acting Head, Prof. Edward R. Stapley, A. & M. College, Stillwater, Okla.

Jan. 20—NEW YORK, N. Y. (Engineering Societies Bldg.).

A. S. M. E. Sanitation Group. (Evening Meeting 7:30 P. M.) Chairman, Wm. Raisch, 227 Fulton St., New York.

Jan. 20-23—NEW YORK, N. Y. (Engineering Societies Bldg.)

American Society Civil Engineers. (Sanitary Engineering Division Jan. 21-22). Sec'y, George T. Seabury, 33 West 39th St., New York, N. Y.

Jan. 23—MOORESTOWN, N. J. (Municipal Bldg.)

South Jersey Ass'n of Water Superintendents. (Meeting 3:30 P. M. Dinner Hotel Newlin, 6:00 P. M.) Secretary, Walter Spencer, 2707 Bethel Ave., Merchantville, N. J.

Jan. 23-24—NEW YORK, N. Y. (Hotel McAlpin)

New York State Sewage Works Ass'n. Sec'y, A. S. Bedell, State Dep't Health, Albany, N. Y. (Joint Dinner A.S.C.E. Sanitary Division and N.Y.S.S.W.A. Jan. 23. Joint Inspection Trip Jan. 24.)

Feb. 11—PORTLAND, ME.

Maine Water Utilities Association. (Bi-monthly Meeting.) Secretary, Earle A. Tarr, Winthrop, Me.

Feb. 19—BOSTON, MASS. (Hotel Statler)

New England Water Works Association. (Monthly Meeting) Secretary, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Mar. 5-6—TRENTON, N. J. (Stacy Trent Hotel)

New Jersey Sewage Works Association. (27th Annual Meeting.) Sec'y, John R. Downes, Plainfield, N. J.

Apr. 9-10—LAFAYETTE, IND. (Purdue Memorial Bldg.)

Indiana Section A.W.W.A. Sec'y, H. G. Horstman, Supt., Water District, Public Service Co. of Indiana, Traction Terminal Bldg., Indianapolis, Ind.

Apr. 15-17—NIAGARA FALLS, ONT. (Gen. Brock Hotel)

Canadian Section A.W.W.A. Sec'y, Dr. A. E. Berry, Director, Ontario Dept. of Health, Parliament Bldg., Toronto, Ont.

Apr. 20-22—SAVANNAH, GA.

Southeastern Section A.W.W.A. Sec'y, A. P. Rice, Supervising Engr., Reconstruction Finance Corp., Bond Service Div., Atlanta, Ga.

Apr. 30-May 1—NIAGARA FALLS, N. Y. (Hotel Niagara)

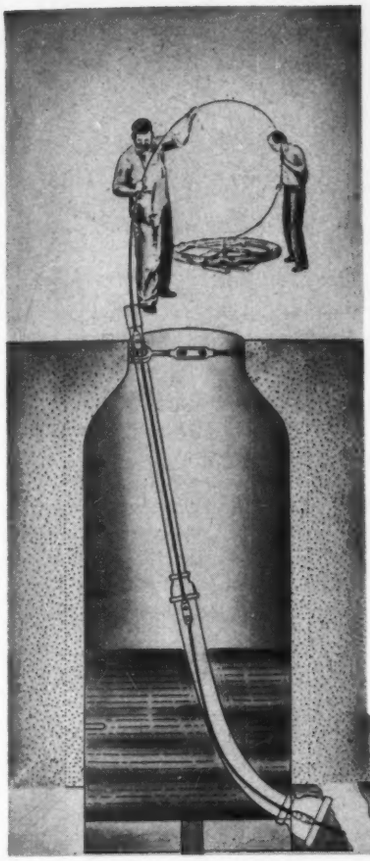
New York Section A.W.W.A. (Spring Meeting.) Secretary, R. K. Blanchard, Neptune Meter Co., 50 West 50th St., New York, N. Y.

May 7-9—WALLA WALLA, WASH. (Marcus Whitman Hotel)

Pacific Northwest Section A.W.W.A. Sec'y, Fred Merryfield, Assoc. Prof. Civil Eng., Oregon State College, Corvallis, Ore.

(*Continued on page* 72)

COOPERATE WITH DEFENSE . . . SAVE WITH "FLEXIBLES"



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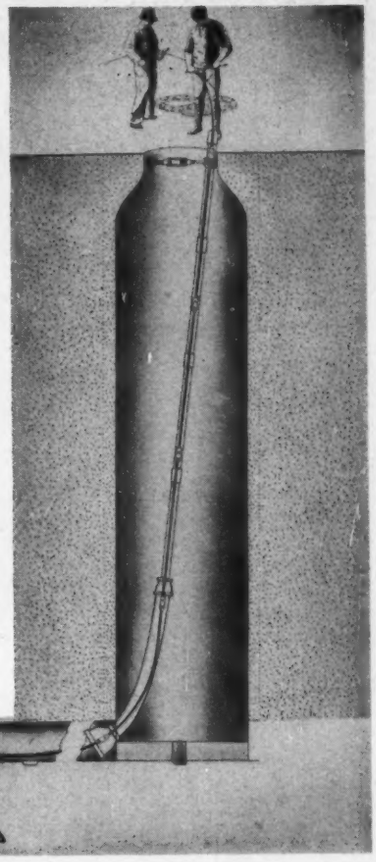

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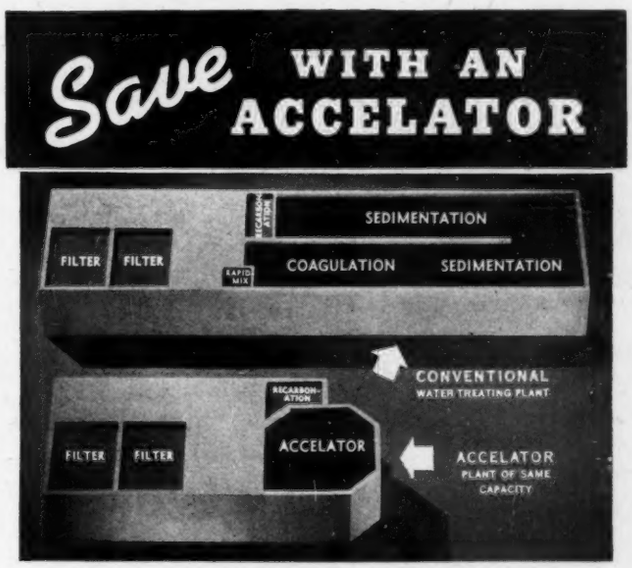

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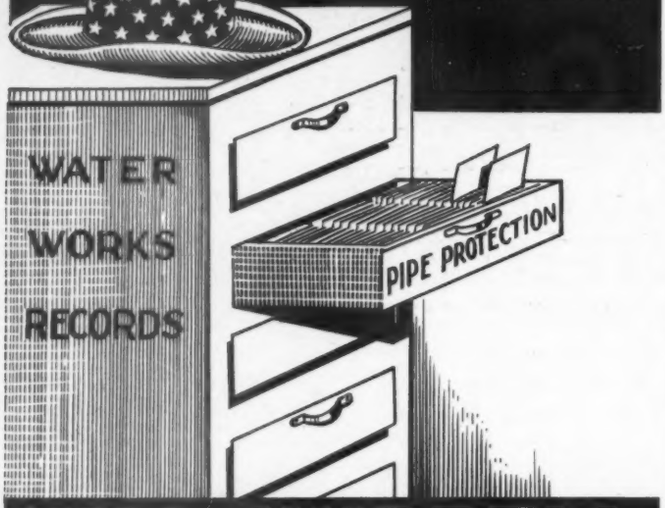

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MEETINGS SCHEDULED

May 15—KENNETT SQUARE, PA.

Pennsylvania Water Works Operators' Ass'n. Sec'y, I. M. Glace, 22 South 22nd St., Harrisburg, Pa.

(Meeting jointly with)

Southeastern Penna. Sewage Works Operators' Ass'n. Sec'y, Gordon J. Wiest, Sewerage Authority, Chester, Penna.

May 15-16—TOLEDO, OHIO

Ohio Section A.W.W.A. Sec'y, Thomas R. Lathrop, 2328 Arlington Ave., Columbus, Ohio.

June 18-19—MINNEAPOLIS, MINN. (Nicollet Hotel)

Central States Sewage Works Association. (15th Annual Convention.) Sec'y-Treas., E. J. Beatty, 458 State Office Bldg., Madison, Wis.

(Note the change in schedule of this meeting from October in the past to June henceforth. This year the dates were purposely chosen to immediately precede the A.W.W.A. Convention, which is to be held in Chicago, June 21-25, with a day for fishing in between.)

June 21-25—CHICAGO, ILL. (Stevens Hotel)

American Water Works Association. (62nd Annual Convention.) Executive-Secretary, Harry E. Jordan, 22 East 40th St., New York, N. Y.

Aug. 24-26—STATE COLLEGE, PA.

Pennsylvania Water Works Operators' Ass'n. (Annual Meeting.) Sec'y, I. M. Glace, 22 South 22nd St., Harrisburg, Pa.

Aug. 26-28—STATE COLLEGE, PA.

Pennsylvania Sewage Works Operators' Ass'n. (Annual Meeting.) Sec'y, Bernard S. Bush, State Dept. Health, Harrisburg, Pa.

Sept. 15-18—POLAND SPRING, ME. (Poland Spring House)

New England Water Works Association. Sec'y, Frank J. Gifford, 613 Statler Bldg., Boston, Mass.

Oct. 12-15—

Southwestern Section A.W.W.A. Secretary, Lewis A. Quigley, City Water Works, 3320 W. Berry, Fort Worth, Texas.

Oct. 15-17—CLEVELAND, OHIO (Hotel Statler)

Federation Sewage Works Association. (3rd Annual Convention.) Sec'y, H. W. Wisely, Urbana-Champaign Sanitary District, Urbana, Ill.

Oct. 15-17—CLEVELAND, OHIO (Hotel Statler)

Ohio Conference on Sewage Treatment. (Meeting with Federation of Sewage Works Associations). Sec'y-Treas., W. D. Sheets,,568 E. Broad Street, Columbus, Ohio.

LITERATURE AND CATALOGS

"Lipco" Cement Lined Pipe is proclaimed the economical and permanent answer to the problem of pipe corrosion in a new brochure prepared by the Cement Lined Pipe Co. of Lynn, Mass. Interesting facts about the early problems faced in lining pipe with cement are given in a preface to a discussion of the modern product wherein the advantages of cement lined pipe are compared with those of brass, lead, and lead-lined pipe. The cement lined product is relatively inexpensive, has no harmful effect on water, and is now constructed to withstand severe stresses and hammer. Eighteen years of experience and development has produced a lining which is unusually smooth and guaranteed against chipping or cracking. A table gives weights and lining thicknesses for pipe sizes from ¾ in. to 12 in. Three inch pipe, weighing 8.3 pounds per foot, is lined with .13 inches of cement. Any reduction in inside diameter of pipe due to lining is said to be compensated by the relatively low resistance of the cement lining. Sandard fittings are lined with lead so as to insure a more perfect contact than can be had from joining two cement ends. For a copy of this informative brochure, which has been issued at a time when the priorities situation throws the spotlight on cement-lined pipes, write to Cement Lined Pipe Co., 93-95 Brookline St., Lynn, Mass.

Emergency Treatment Units are featured in a recent mailing piece received from Proportioneers, Inc., of Providence, which briefly describes and pictures the new Dual Drive Portable "Chlor-o-Feeder" which can be operated by electric motor or gas engine as the case demands, this unit being equipped with both. Designed for wide application under variable conditions, this unit is capable of feeding not alone hypochlorite solution but any other chemical solution desired. The other war-born unit is the "Pur-o-pumper" which is a miniature portable filter plant and chlorination unit combined, for transient or emergency use. It was designed especially for field service with the U. S. Army. And Proportioneers also offers to build what the company calls a "Blitz-Buggy" to meet specifications and particular requirements in the nature of a full complement of emergency equip-

(Continued next page)

A GOOD measure of Wisconsin's success as an agricultural state can be credited to its crusade against soil depletion.

Farmers, truck gardeners, park, cemetery and golf course caretakers of the Badger State all know the value of properly prepared dried sewage sludge as a soil builder. The fine work of the Milwaukee, Wisc., Sewerage Commission in making available to the nation Milorganite, a sewage sludge fertilizer, is well known.

Ten other Wisconsin cities have joined this war on waste of sewage sludge — Appleton, De Pere, Green Bay, Kenosha, La Crosse, Rhinelander, Shawano, Sheboygan, Sheboygan Falls and Wausau. They aerate, further dry and shred sludge cake, in some cases mixing in enrichening materials with Royer Sludge Disintegrators. Incineration and burial costs are eliminated and a profit realized. Lawn dressing and fertilizer is made available to city parks and golf courses.

These times call for conservation of our resources—join the War on Waste starting at your sewage plant! Send for the facts on the 12 models of Royer Sludge Disintegrators and what they are doing in every State.

Model "SH"—one of 12 portable and stationary gasoline engine, electric and belt-to-tractor driven models.

THE ROYER

ROYER FOUNDRY & MACHINE CO.
170 PRINGLE ST., KINGSTON, PA.

ment and mounted on wheels ready for speedy towing to the scene of application. In addition, the reprint of a paper, dealing with emergency chlorination practice and equipment therefor, already reviewed in our December issue, also accompanies the mailing piece captioned "Emergencies!" which may be had by writing Proportioneers, 9 Codding St., Providence, R. I.

Dresser Adjustable Repair Sleeves are the new 3-part sleeves designed to repair breaks in cast iron pipe quickly and without any interruption in service. Construction details as well as instruction for installing are given in a recently published illustrated leaflet. The new repair sleeve (Style 82) consists of three gray iron sections faced at the factory with both side and end gaskets. The three sections are assembled with six sidebolts to form a permanent, pressure-tight sleeve. A copy of the leaflet may be obtained by writing to Dresser Manufacturing Co., Bradford, Pa.

Enamels and Coatings are covered in a new illustrated folder from Inertol Co., commenting on their principle enamels and protective coatings. Included in a list of seven featured products are the following: Inertol, for waterproofing concrete and steel, underground, under water, and in damp atmosphere; Ramuc, a high grade swimming pool enamel; and Torex, a chemical resistent coating. Illustrations show plants and water works systems where Inertol products have been employed. For additional information write to Inertol Co. at their new plant, 470 Frelinghuysen Ave., Newark, N. J.

Evaporative Coolers for Combustion Engines are described in a new Fairbanks-Morse Bulletin FECD-2, generously illustrated with photographs of models and parts, dimension drawings, and piping layout diagrams. The F-M cooler is said to provide maximum efficiency in cooling jacket water, of either diesel or gas engines, and to eliminate many sources of trouble encountered in the conventional direct cooling system. A thorough treatment of the design and construction of the unit is given in the bulletin. The frame is of electrically welded angle iron, hot-dipped galvanized after fabrication. Units are equipped with "builtogether" pumps and motors. A tabulation of cooler sizes and capacities is also included. For a copy of Bulletin FECD-2 address Fairbanks-Morse & Co., Chicago, Ill.

Texrope Drives is the title of Allis-Chalmers new bulletin B-6047 describing and illustrating their line of V-belts, steel and cast iron sheaves. The recently improved "Super-7" belts are available in five ranges of sizes. Numerous types of sheaves are illustrated including a motion control "vari-pitch" model used when speed changes are required while the drive is in motion. Fixed speed sheaves carried in stock include the new "duro-brace texsteel," fabricated from pressed steel, and the light weight cast iron "texdrive." Both are furnished with from one to six grooves. Comprehensive tables in the bulletin list available sizes, dimensions, and list prices. A copy of bulletin B-6047 can be had by addressing Allis-Chalmers, Milwaukee, Wis.

Gardner-Denver Type BA Centrifugal Pumps—designed for services requiring a rugged, heavy duty pumping unit of the side suction type—are presented in the manufacturer's new illustrated folder. Specifications of the pumps include bronze impellers, keyed to the

(*Continued next page*)

Many long service records prove the durability of CONCRETE PIPE

SAVANNAH, GA.— Concrete pipe sanitary sewer installed in 1870; condition excellent at inspection in 1927.

ST. PAUL, MINN.— Test specimens of 12-in. concrete pipe sanitary sewer in excellent condition in 1931 after 45 years.

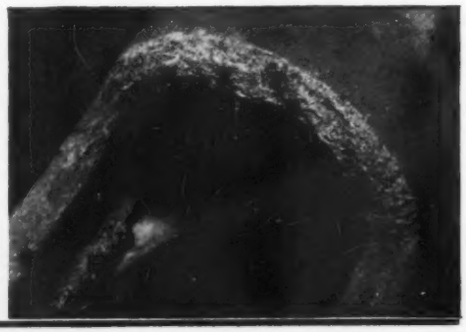
Since the inception of sewerage, concrete pipe has been used for building sanitary, combined and storm sewers.

The concrete sewer pipe pictured here are veterans with service records up to half century and more. The sewers of which they are a part were found on inspection to be in excellent condition.

Durability records like these account for the vast scale on which concrete sewer pipe is in use throughout the world. And it is the best possible evidence that concrete pipe sewers, properly designed and constructed under the supervision of competent sanitary engineers, will serve your community for many decades with utmost economy.

PORTLAND CEMENT ASSOCIATION
Dept. 1-29, 33 W. Grand Avenue
Chicago, Ill.

A national organization to improve and extend the uses of concrete...through scientific research and engineering field work.



MINNEAPOLIS, MINN. — 12-in. concrete pipe sanitary sewer installed in 1886. Found to be in excellent condition in 1933, after 47 years. Minneapolis has more than 35 miles of this old concrete pipe in its sewerage system today.

shaft and secured with an impeller screw; alloyed cast iron casings; high carbon alloy steel shafts, accurately ground and polished to size; and heavy duty grease lubricated ball bearings, contained in a dust and splash proof housing. For folder (A-8) write to Gardner-Denver Co., Quincy, Ill.

Pumps for Acid, Ferric Chloride, etc., are featured in Bulletins No. 308 and No. 307 lately received from Oliver United Filters. The "Olivite" acid-handling pump derives its patented name from the special rubber base composition, firmly bonded to casing and cover, which combines corrosion-resisting qualities with high tensile strength. The bond has a potential life as great as that of the pump, the bulletin states, for it is unaffected by temperature, pumping pressures or abrasive particles. Mechanically the pumps are as simple and efficient as centrifugal water pumps. Casing cover can be readily removed for inspection without disturbing casing, base, motor or discharge pipe. Other special features are shown in a cross-sectional drawing. Olivite pumps, manufactured in sizes of 1¼", 2", and 4", are applicable to nearly all varieties of hot or cold acids, chlorine solution, ferric-chloride, and other corrosive solutions.

The diaphragm slurry pump, described and illustrated in the companion bulletin No. 307, is especially suitable for handling solutions carrying solids in suspension which may prove too abrasive for a centrifugal acid-handling pump. It is actuated without mechanical linkage or other mechanical connections to the diaphragm. A timed impulse is applied by compressed air or vacuum to one side of the diaphragm and thereby transmitted to the solution on the other side. Oliver diaphragm pumps are obtainable in sizes of 1", 2" special or standard, and 3", flow capacities ranging from 5 to 60 g.p.m.

For information on the Olivite acid-handling pump (Bull. 308) or the slurry pump (Bull. 307) address Oliver United Filters, Inc., 33 West 42nd St., New York, N. Y.

Automatic Analyzer and CO_2 Recorder is the unit of Micromax recording equipment ably treated in the recently revised Leeds and Northrup catalogue No. N-91-163. A new feature of the assembly brings the flue-gas sample in contact with nothing but glass from the time it leaves the stack until it is analyzed, thereby eliminating maintenance due to corrosion of metal parts. The equipment comprises four units: (1) the primary filter; (2) the gas analysis assembly, including the cell, saturator, and filter; (3) a sampling line, connecting primary filter to cell assembly; and (4) the indicating recorder. The process of saturating CO_2 gas with water vapor instead of drying it was introduced by Leeds and Northrup in 1937. The saturated-gas cell avoids both undue time in conditioning gas and the costly use of chemicals. Indicating recorders are available in two models. Model R indicates on a large dial and records on a 24-hour circular chart. Model S, indicating on a straight scale, is designed to record over periods of several weeks. The 16-page catalogue is amply illustrated with photographs of recorders and cell assembly and with drawings showing mounting dimensions. For a copy write to Leeds and Northrup Company, 4901 Stenton Ave., Philadelphia, Pa.

(Continued next page)

An Important Message from Stuart-Brumley Corp.

IN the interest of national defense, it has been pointed out that many box cars could be released for service if 30 tons were placed in a car instead of the minimum 20 tons.

During this crisis, we are asking consideration that a 30-ton car, or even a 40-ton car, be ordered instead of a minimum 20. This will release for other services many extra box cars.

STUART-BRUMLEY TELLS HOW TO CHOOSE THE *RIGHT* COAGULANT FOR YOUR PLANT.

BLACKALUM

$1.50 per cwt. f. o. b. Baltimore carload lots

A POWERFUL DEODORIZING AND DECOLORIZING COAGULANT

Activated Blackalum is an outstanding premium coagulant at $2.00 more per ton. It won't allow sludge to ferment in the basins. It is fast flocing over wide pH range. It is for the superintendent who will pay a little more to get complete satisfaction from winter coagulation worries.

ACTIVATED ALUM

$1.40 per cwt. f. o. b. Baltimore carload lots

ECONOMICAL CONTAINS HIGH ALUMINA

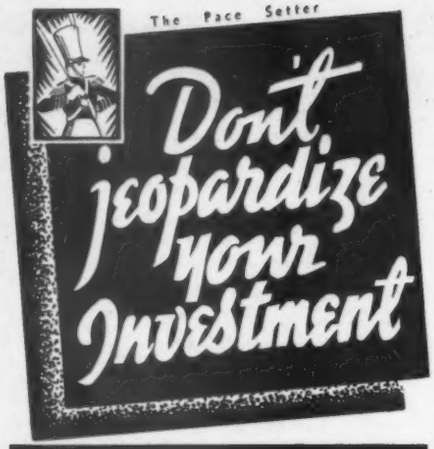
Standard Activated Alum is one of America's largest selling coagulants. It is the type preferred by the alert superintendent who wants maximum coagulation economy with greatest efficiency.

STUART-BRUMLEY CORP.

516 N. CHARLES ST. BALTIMORE, MD.

Stuart-Brumley Corp. offers better service . . . better products . . . and Activated Alum and Blackalum are better liked daily

Other products of Stuart-Brumley Corp.: Co-Res-Co Protective Coating for steel and cement; Palmer Filter Bed Agitators; Tate Cement Lining in Position; Champion Activated Carbon; Chlorinated Bleaching Clay.



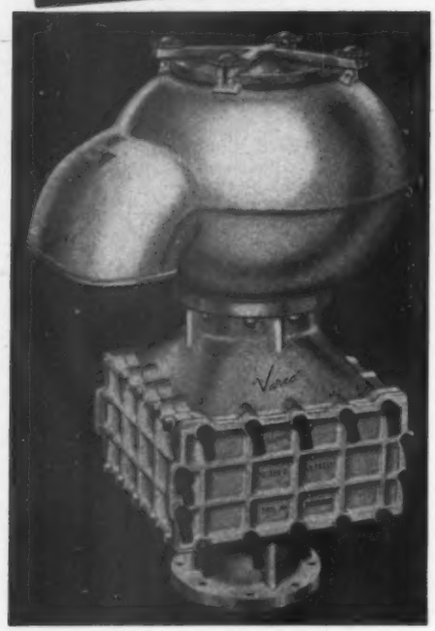


Fig. 58C "VAREC" Pressure Relief and Vacuum Breaker Valve with Flame Arrester.

GOOD DESIGN IS BUILT INTO

"Varec" Approved EQUIPMENT

The cost of controlling all combustible sewage gases with safety is a relatively small part of the total investment of your Treatment Plant. The installation of a "VAREC" Fig. 58C on a digester or a gas holder dome eliminates the danger of fire hazard and gas explosions. Specify "VAREC" and you will not jeopardize your investment of the Treatment Plant. "VAREC" Engineers will collaborate with you at any time.

The Vapor Recovery System Company

Compton, California

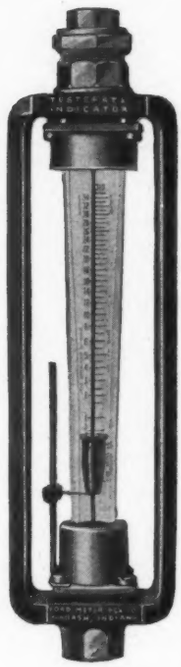
Branch Offices: Stock carried at:
New York — Tulsa, Oklahoma — Houston, Texas

Oilless Bronze Bearings of "Metaline" are described in a new, handsomely illustrated, 16-page catalogue. The first section discusses the properties and functions of the lubricant, Metaline, a mixture of white metal, metallic oxides, waxes and other substances. A second section enumerates the various shapes, sizes and applications of Metaline bearings. The catalogue states that they serve perfectly in surroundings where chemicals or atmospheric particles affect other lubricants. The final pages present detailed data for use in preparing specifications. A copy of the catalogue can be obtained by writing the R. W. Rhodes Metaline Co., Inc., Long Island City, N. Y.

Supplementary Treatment of boiler feedwater is comprehensively dealt with in a 12-page illustrated bulletin recently received from the Permutit Co. The book concerns itself primarily with the purpose of supplementary treatment and with a discussion of the methods and chemical effects of feeding phosphate, sodium sulphite and sodium sulphate. The introduction of phosphate into boiler feedwaters is designed to reduce the excess sodium carbonate alkalinity to the lowest practical point. In that phosphate is relatively expensive it is advised that hardness first be reduced as much as possible by water softeners. Drawings show methods of feeding phosphate into boiler drum, pump suction, and into makeup line ahead of a deaerating feedwater heater. Systems of feeding sodium sulphite, designed to consume the remaining oxygen in feedwater, and of feeding sufficient sodium sulfate to maintain a proper ratio of this chemical and sodium carbonate are discussed in the final pages of the bulletin. For this informative literature ask for Bulletin No. 2420, from Permutit Company, 330 W. 42nd St., New York, N. Y.

Wheelco Control Instruments are presented in a new condensed catalogue giving brief descriptions, model numbers, and list prices. Remote controllers, potentiometers, thermocouples, pyrometers and recording thermometers are among the items illustrated and more fully described. Of special interest is the Wheelco "flame-otrol," designed for positive protection against explosive hazards in every type of fuel fired equipment. For the condensed catalogue request Bulletin No. Z-5000 from the Wheelco Instruments Co., Harrison and Peoria Sts., Chicago, Ill.

The FORD TESTERATE INDICATOR



To test your water meters correctly you must know accurately the rates of flow at which tests are run. The Testerate Indicator shows rates from under ¼ G.P.M. to over 30 G.P.M. instantly and accurately. It can be used to modernize testing equipment, being easy to install and simple to use. Hundreds in service.

WRITE FOR MORE INFORMATION ABOUT THE FORD TESTERATE INDICATOR

FORD METER BOX CO.,

WABASH, IND.

EQUIPMENT NEWS

New Photoelectric Smoke "Tell-Tale"

● Photoswitch Inc. of Cambridge, Mass., have just developed a new and improved Photoelectric Smoke Alarm which serves as a combustion efficiency tell-tale by ceaselessly watching the stack vapors and giving signals indicating smoke density.

Known as Type A25C the Photoswitch Smoke Alarm system is comprised of three units—light source, photoelectric control transmitter and the receiving indicator (Densometer) here pictured.

The photoelectric control unit and light source are mounted on opposite sides of the flue or stack. They are aligned so that the light beam projects to the eye of the photoelectric control. The design of the lens system mounting minimizes the possibility of soot and dust gathering on the lenses.

The photoelectric control is wired to the Densometer which may be located at any point in the power or incinerating plant for observation by the engineer and operators. The Densometer gives a continuous indication of the smoke density. A small green signal light signals efficient combustion and a large red bulls-eye indicates when excessive smoke is passing through the stack. In incinerator operation not only does the Smoke Alarm indicate low combustion efficiency but is also an indicator of likely odor nuisance.

For further details write Photoswitch Inc., 21 Chestnut St., Cambridge, Mass.

"Aqua-Clear" a New Corrosion Preventative

● "Aqua-Clear" is a new product offered by Sudbury Laboratories for adding to water as a corrosion preventative or inhibitor. It is also claimed as

(Continued next page)

SIMPLEX

for ACCURACY • RELIABILITY SOUND ENGINEERING IN FILTRATION PLANT EQUIPMENT

THESE factors — Accuracy, Reliability, Sound Engineering — have resulted in the past forty years in the installation of Simplex Rate of flow Controllers, Gauges, Venturi Meters in the world's finest filtration plants.

First to develop the Direct-acting Controller, the Master Control, the Bell-shaped Float, and the Sand Expansion Indicator, the cardinal policy of Simplex is to increase its usefulness to the waterworks profession by continued research, design and cooperative measures with both designing and operating engineers.

SIMPLEX PLEDGES ITS ENTIRE FACILITIES TO MEET THE DIVERSE PROBLEMS OF THE NATIONAL EMERGENCY.

Simplex Valve & Meter Company
68TH & UPLAND STS.
PHILADELPHIA

a rust and tubercle loosener when added to partially clogged piping systems, radiators, etc.

"Aqua-Clear" comes in liquid form and claimed to be as tasteless as it is harmless when added to drinking water in quantities prescribed for corrosion prevention.

To prevent attack on zinc, copper, brass or steel one application of 1 ounce (teaspoonful) to each 100 gallons of water to be treated. For rust removal a larger quantity is recommended.

Portection with "Aqua-Clear" is said to be due to the production of a protective film which is too thin, however, to impede water flow. It is recommended for either hot or cold water systems, automobile radiators and the like.

For discriptive folders write the Sudbury Laboratories, Sudbury, Mass.

WITH THE MANUFACTURERS

Meter of Lucite Proved Attraction at Kansas City Show

Director of Water Kenneth K. King (left) and Chief Engineer and Supt. Melvin P. Hatcher Taking a Look at the Trident Meter Which Had no More Privacy Than a Gold Fish

● On December 12th-16th the City of Kansas City, Mo., put on a "Know Your City" show in the Municipal Auditorium that proved to be a worthwhile project, attended by 35,000 citizens who now know much more about their city and also "What's Behind the Water Tap."

The Water Department's display occupied 5,000 ft. of floor space. The display included a large scale map of the distribution system, drawings and motion pictures in color of the purification plant and its functions, treatment for taste and odors and improved water softening methods. In addition, there were operating models on display.

Always of interest to those who pay the water bills was the meter display. Here employee attendants, with the aid of cut-away meters, explained their

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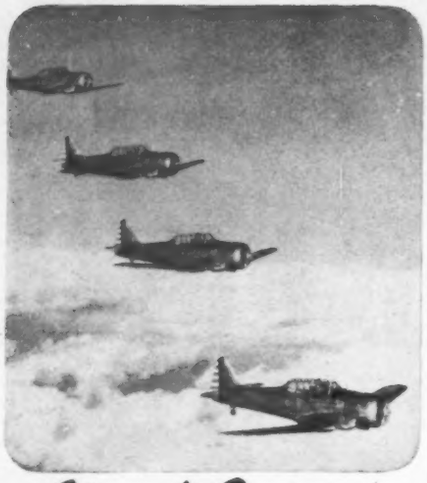


North American's Dallas Plant

DEPENDS ON LAYNE WELLS AND PUMPS

Startling the Nation by going into production just one hundred and twenty days after construction began, the Dallas plant of North American Aviation, Inc., is now rolling out their famous Army AT-6A and Navy SNJ-3 Scout Trainer Planes. Factory and assembly space is completely air conditioned as an aid to accuracy, speed and efficiency in manufacturing.

As was the case with defense projects throughout the Nation, North American chose Layne Wells and Pumps for their water supply. Something over 1,400,000 gallons of water daily is available from their two Layne Units . . . and that capacity can go on day after day, month after month for years to come. In efficiency and dependability Layne Wells and Pumps have no parallel.

When the final chapter of America's greatest war is written, the part played by Layne Wells and Pumps will be a very absorbing story. Certainly in all the world, as hundreds of installations testify, there are no finer Well Water Systems. To meet the country's urgent demand for more and more production you may need more water. Act now! Communicate with Layne. Wire or address,

LAYNE & BOWLER, INC.
Memphis, Tenn.

LAYNE PUMPS & WELL WATER SYSTEMS

Affiliated Companies

Layne-Arkansas Company	Stuttgart, Ark.
Layne-Atlantic Company	Norfolk, Va.
Layne-Central Co.	Memphis, Tenn.
Layne-Northern Company	Mishawaka, Ind.
Layne-Louisiana Company	Lake Charles, La.
Layne-New York Co.	New York City.
Layne-Northwest Company	Milwaukee, Wis.
Layne-Ohio Company	Columbus, Ohio
Layne-Texas Company	Houston, Texas.
Layne-Western Company	Kansas City, Mo.
Layne-Western Co. of Minn.	Minneapolis, Minn.
Layne-Bowler New England Corp.	Boston, Mass.
International Water Supply, Ltd.	London, Ont.

WORLD'S LARGEST WATER DEVELOPERS

TODAY'S TREND

●

is toward the use of ferric salts for water and sewage treatment.

FERRI-FLOC is a SUPERIOR coagulant that is more ECONOMICAL — more EFFICIENT and SIMPLER to use.

Write today for literature.

Ferri-Floc
TC Tennessee Corporation
FERRIC SULPHATE

Tennessee Corporation
ATLANTA, GA. LOCKLAND, OHIO

LEADITE

The Pioneer Self-Caulking Material for C. I. Pipe

Widely Known

and used by water works men

LEADITE saves in cost of material . . . in caulking charges . . . in digging of large bell holes . . . in cost of trench pumping! Makes a good, tight, lasting joint!

THE LEADITE COMPANY
Girard Trust Co. Bldg., Philadelphia, Pa.

No Caulking

construction, and operation—also the need for periodic check-ups to prevent meters from running slow, rather than fast as most water users are prone to believe meters have a penchant for doing.

The chief attraction in the meter display proved to be the Trident Meter with its 100% transparent case of sparkling lucite, loaned the water department for display purposes by Neptune Meter Co. There is nothing to attract attention better than a few wheels going around, and this the "gold-fish" meter did. This made simple the explanation of the workings of a meter and stripped away all of the mystery to the average water customer. [On this score we would recommend that water-works managers over the country endeavor to borrow from manufactuerrs a Lucite cased meter for its attraction and educational value. It would seem to us a justifiable investment if each water company and water department could purchase a Lucite cased meter for constant display near the bill collection windows.—Ed.]

To City Manager L. P. Cookingham goes credit for conception and direction of the "Know Your City" Show which was believed to have made many friends for the Water Department and also other departments of the city.

Allis-Chalmers Makes Babb Board Chairman; Elects W. C. Buchanan to Presidency

Max W. Babb
(From Presidency to Board Chairman)

● It has recently been announced that Mr. Max W. Babb hos been made Chairman of the Board by Directors of Allis-Chalmers Mfg. Co. and that Mr. W. C. Buchanan, a director and member of the Board's Executive Committee, has been elected to succeed Mr. Babb as President of Allis-Chalmers.

Mr. Buchanan, now 53 years old, was born in Johnstown, Pa., and attended Carnegie Tech. In 1904 he went to work with Cambria Steel Co. and rose to the position in charge of a number of Cambria's Mills by 1912. Since that time he has held numerous important positions in the steel products field. For the past 6 years he has been president of the Globe Steel Tubes Co. of Milwaukee in which capacity he will continue while also serving as Allis-Chalmers' president.

Mr. Babb, now 68 years old, was born in Mt. Pleasant, Iowa. He graduated from Iowa Wesleyan College in

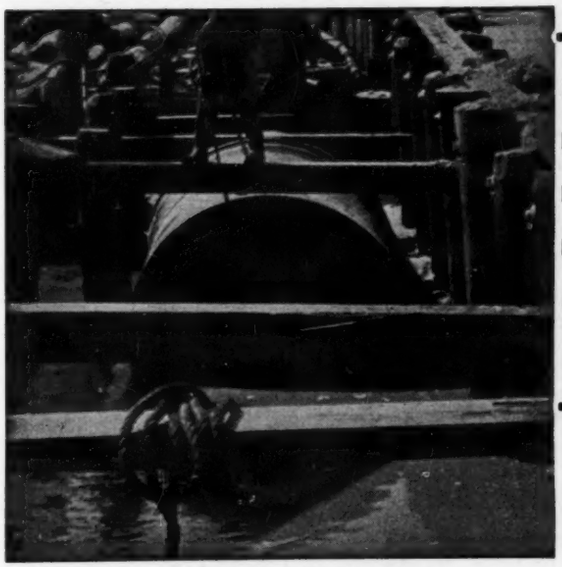
(Continued next page)

BUILDERS

VENTURI

Meters and Controllers, installed on many Army and Navy projects, are doing their share in supplying potable water to our boys wherever they are serving "Old Glory."

BUILDERS - PROVIDENCE, INC.
(DIVISION OF BUILDERS IRON FOUNDRY)
PROVIDENCE . . . RHODE ISLAND



84" pipe—Spring Lake, N. J.

FLANGED PIPE
FLEXIBLE JOINT PIPE
BELL & SPIGOT PIPE
SPECIAL CASTINGS
SHORT BODY BELL & SPIGOT SPECIALS

Large stock enables us to make prompt shipments.

CAST IRON PIPE

SIZES 2" TO 84"

Warren Foundry & Pipe Corp.
11 Broadway, New York

Warren Pipe Company of Mass., Inc.
75 Federal St., Boston

FIRST Line of DEFENSE on the SANITARY Front

Ferri-Clor ISCO Ferric Chloride

For SLUDGE CONDITIONING—a most efficient agent for COAGULATING SEWAGE—effective and economical

Ferri-Clor (60% $Fe Cl_3$) is manufactured in our own plant at Niagara Falls, N. Y.

INNIS, SPEIDEN & COMPANY, *Established 1816*

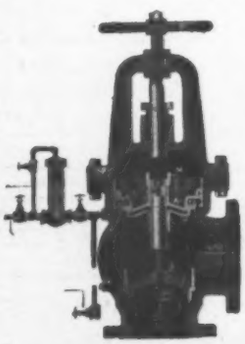
117 Liberty Street • NEW YORK

CHICAGO • CLEVELAND • CINCINNATI • BOSTON • PHILADELPHIA • GLOVERSVILLE, N. Y.

Triple-Acting Non-Return Valve

This valve will automatically cut in a boiler whenever its pressure equals line-header pressure; it will isolate a boiler automatically whenever its pressure, from any cause, is lower than line-header pressure; and it will prevent steam flow from the boiler in event of sudden drop of line-header pressure below the boiler pressure, by means of differential shot pilot valve functioning.

Write for specifications.



Furnished in angle, globe and elbow patterns, sizes 2½" to 12"; also available in larger sizes, as well as in the Cross pattern.

GOLDEN-ANDERSON VALVE SPECIALTY CO.

Fulton Building Pittsburgh, Pa.

HYDRO-TITE

A DEPENDABLE self-caulking joint compound used to joint cast iron bell and spigot pipe. Much easier to use than lead and makes stronger, more flexible and tighter joints.

Employed on thousands of miles of pipe from 4" to 60". Write for our free trial offer.

HYDRAULIC DEVELOPMENT CORPORATION

MAIN SALES OFFICE - 50 CHURCH STREET, NEW YORK
GENERAL OFFICES AND WORKS - WEST MEDFORD STATION BOSTON, MASS.

OVER 25 YEARS WITHOUT A FAILURE

1895 and secured his Bachelor of Law degree at Univ. of Michigan in 1897. In 1904 he joined Allis-Chalmers Co. as its attorney, becoming Vice-President in 1913 and was made president in 1932. He now succeeds to the Board Chairmanship, vacant since the death of General Otto Falk in 1940.

Mr. Babb is a director of the Federal Reserve Bank of Chicago; the N. Western Mutual Life Ins. Co.; Cutler Hanover Inc.; Wisconsin Telephone Co., and other companies. In college he was a member of the fraternity Beta Theta Pi and continues his membership in the American and the Wisconsin Bar Associations. He is also a club man with memberships in the Milwaukee Club, University Club and the Country Club of Milwaukee.

E. Shaw Cole Becomes Chief Engineer of the Pitometer Co.

● The Pitometer Company, Inc., Engineers, New York City, announce that E. Shaw Cole has been promoted to the position of Chief Engineer. Edgar K. Wilson, who for many years held the position of Chief Engineer, will act as Consulting Engineer for the firm and will retain his position as Treasurer as well.

Mr. Cole, a graduate of the Thayer School of Civil Engineering, Dartmouth College, in 1931, obtained a Masters degree in Sanitary Engineering from New York University in 1939. Since his graduation from Dartmouth he has been actively engaged with The Pitometer Company as a field engineer in charge of Water Distribution Studies, Trunk Main Surveys, and Water Waste Surveys. Following his graduation from New York University he was associated for about a year with Newsome and Aldrich, Consulting Engineers of New York.

Sparling Meter Distributing Unique Charts

● R. W. Sparling, meter manufacturers of Los Angeles, have for distribution without charge a useful folder of unique conversion charts of interest to water works and sewage operators and engineers.

This pocket size folder contains three charts. At a glance, one converts water flow and volume measurements from one set of terms into several others by merely running the eye along a perpendicular red line. Another reveals equivalents in terms of weight, volume and power requirements in pumping. The third reveals the relationship of pipe line flow (g.p.m.) in terms of velocity through pipes of various diameters, and also the reverse.

The chart folder may be obtained merely for the asking by writing R. W. Sparling, Box 3277, Terminal Annex, Los Angeles, Calif.

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THE JOINTS ARE LAPPED

AVAILABLE *Now!*
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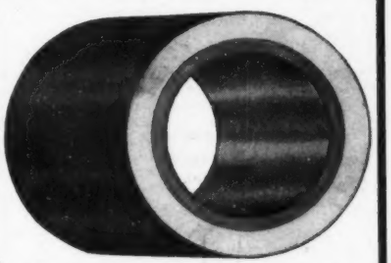
Cement Lined Service Pipe



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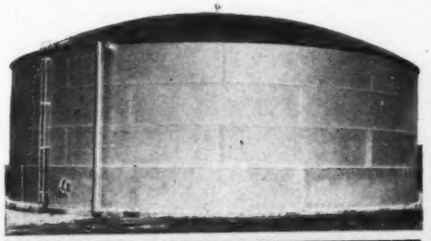
RESERVOIRS

P-DM Steel Reservoirs and Standpipes provide greatest economy in water storage—are permanently water-tight, may be erected at any time of year, and for maintenance require but a periodic coat of paint. All types and sizes up to 4,000,000 gallons. Bulletin No. 102.



PITTSBURGH · DES MOINES STEEL COMPANY
Pittsburgh, Pa. . . . 3418 Neville Island
Des Moines, Ia. . . . 919 Tuttle Street

Beitzel Becomes Penna. Salt's V. P. in Charge of Sales

George B. Beitzel

● George B. Beitzel has been promoted by Pennsylvania Salt Mfg. Co. from manager of Sales to Vice President in charge of sales.

Mr. Beitzel's elevation to No. 1 position in this company's Sales Division is of interest to readers of this magazine because of Penn. Salt's long identification with the water supply and sewerage disposal fields in supplying alum, soda ash, sodium aluminate, chlorine, hypochlorites and ferric chloride. In this activity the new Vice President's special achievement has been the very successful introduction and marketing of "Perchloron," the super-hypochlorite, new used widely in water and sewage treatment and swimming pools.

Mr. Beitzel's career is an example of the success which can come to a man of diligence and steady and unflagging perseverance. He was educated in the public schools of Philadelphia and the University of Pennsylvania. He served his country in World War No. 1, advancing from the rank of a private to a first-lieutenancy. It is only twelve years since he came to Penn. Salt and his elevation first to Manager of Sales and now to the head of this "old-line" company's sales organization in so brief a time is no little achievement.

Mr. Beitzel's high standing in the field of sales management is well attested by the fact that he has during the year been elected President of the Sales Managers' Association of Philadelphia.

Lee Chamberlain Joins American Well Works as Eastern Manager

L. H. Chamberlain

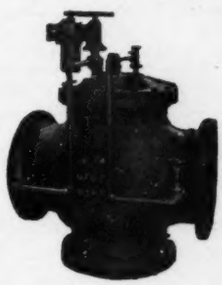
● Lee H. Chamberlain, former manager of water works and sewerage sales for Crane Co., has become associated with The American Well Works of Aurora, Ill. and has been appointed Eastern District Supervisor with headquarters in New York City.

Mr. Chamberlain became well known in the East during his connection with Crane Co., which he left when this company discontinued its Division of Water Works and Sewerage Sales when it became imperative that first

· 1879 ·
ROSS
· AUTOMATIC VALVES

ALTITUDE VALVES
for
Control of elevation and heads into and out of tanks, basins and reservoirs.
1. Single acting.
2. Double acting.
3. Combination assembly for three or more automatic operations.

COMBINATION VALVE
Combination automatic control both directions through the valve.
A self-contained unit, with three or more automatic controls.



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Electric remote control—solenoid or motor can be furnished.
Adapted for use as primary or secondary control on any of the hydraulically controlled or operated valves.

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INCORPORATED
P. O. BOX 595, TROY, N. Y.

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TYPE DES

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HYPO-CHLORINATOR
AND
GENERAL CHEMICAL
FEEDER
Available in Manual
Semi-Automatic—Automatics

There is a Pulsafeeder to give Perfect Results, whether the installation is a gravity water supply, pumped supply, or a swimming pool.

WILSON CHEMICAL FEEDERS, INC.
Buffalo, N. Y.

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FOR SEWAGE TREATMENT AND WATER SUPPLY . . .

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Bailey Meter Co. Ltd., Montreal, Canada

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MECHANICAL JOINTS
● CHARCOAL IRON BOLTS ●
for Cast Iron Pipe and Fittings
(Also Leak Clamps)
WRITE FOR PRICES
CARSON CADILLAC COMPANY
1221 PINSON ST. BIRMINGHAM, ALA.

attention be given government contracts in the present emergency.

Prior to his connection with Crane Co. Mr. Chamberlain, a Californian, was best known on the Pacific Coast where since 1926 he had been manager of the Water Works Suppy Co. of San Francisco, Los Angeles and Seattle. During World War No. 1, he served with the A.E.F. in France as Signal officer. He is a member of the Am. Soc. of Mechanical Engrs., and Am. Water Works Ass'n. He is a registered Civil Engineer in California.

In his new position Mr. Chamberlain will concentrate on service and sales in the water, sewage and trade-wastes treatment fields, and give American Well the type of representation that has long been needed in the East and Southeast.

American was for years best known for its water supply and deep-well pumps, but in recent years have broadened its pump lines and added sewage treatment equipment such as aerators for activated sludge, revolving trickling filter distributors, etc. It is the company's intention to extend the lines offered in the sanitary field and where possible to improve those items already being offered.

"Service with Sales" is Mr. Chamberlain's motto and his latch string hangs out at American's Eastern District's office—Suite 2702, 165 Broadway, New York City.

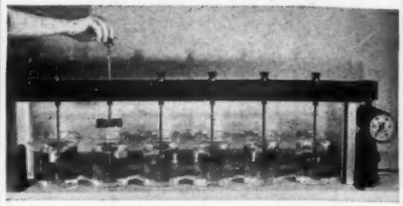
Aluminum Co. Advertising Wins First Award

● Top honor in industrial advertising was won this year by Edward L. Andrew, of Fuller & Smith and Ross, Inc., for the series "Aluminum, Defense and You," written by Mr. Andrew for the Aluminum Company of America. The selection was announced in this month's issue of *Industrial Marketing* which features this award annually.

Mr. Andrew, who is a vice-president of the agency, featured in Aluminum Co's last year's copy the achievements of the company in the national defense program. Some of the outstanding developments described in the series were: (1) expansion of aluminum production to a rate several times that of 1938, the last full peacetime year; (2) completion of a major portion of the $215,000,000 expansion program, which Alcoa financed entirely with its own funds; (3) reduction of the aluminum ingot price to 15 cents a pound, the lowest level of all time, and (4) the company's temporary, but complete, foregoing of civilian markets built up over half a century.

C. C. Carr, advertising director of the Aluminum Company and director of the Association of National Advertisers, was in charge of the series. With members of his department Mr. Carr was instrumental in selection of copy themes for development and execution by Mr. Andrews and his agency staff.

THE *Phipps & Bird*
LABORATORY MIXER . . .



IS the important piece of equipment in the Modern Water Works Laboratory. Now being used by leaders in water works research. Many superintendents and chemists have been able to reduce their chemical costs by the control of chemical dosages with this mixer. Write for literature.

PHIPPS & BIRD, INC. Richmond, Va.

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SPIRAL GEARS
(A Phoenix Patent)

Have an Excellent Record of Dependable — Accurate Service *Since 1914.*

Repair Parts for Water Meters
We furnish Parts for
UNION KING METERS
Send inquiries for prices.

PHOENIX METER CORP.
PRINCE BAY, S. I. NEW YORK, N. Y.

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Smallest Diaphragm Pump Made, 2" Suction Open Discharge. Capacity 1400 G.P.H. Weight 50 lbs. Size No. 1.

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AFTER CLEANING

CLOGGED PIPES

Made Good as New

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Our illustrated Booklet, "The Cleaning of Water Mains," will be sent upon request.

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115 Peterboro St., Boston, Mass.
910 William Oliver Bldg., Atlanta, Ga.
7103 Dale Ave., St. Louis, Missouri
208 E. Forsyth St., Jacksonville, Fla.
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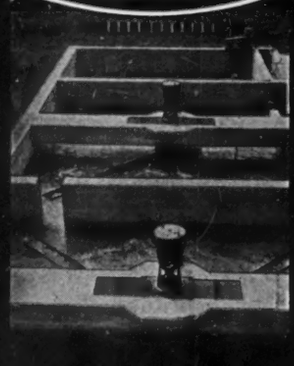
501 Howard St., San Francisco, Calif.
2028 Union Ave., Montreal, Canada

AER-O-MIX
AERATOR - MIXER



Down-Draft Type
MECHANICAL
SEWAGE AERATORS

Write for information on AER-O-MIX for your SEWAGE or WATER TREATMENT APPLICATION.

VOGT MFG. CO.
INCORPORATED
P. O. Box 1122 Louisville, Ky.

Ranney Water Collector Transfers Main Offices to Louisville

● The Ranney Water Collector Corp., of New York, developers of the radial well method of water collections, has transferred its main offices from New York City to Louisville, Kentucky, effective January 15th.

The Ranney method of obtaining water from sub-surface-water bearing levels employs a central caisson sunk to varying depths, from which slotted screen collector pipes are projected radially into the water-bearing strata. The largest ground water development project in America is at Charlestown, Ind., where seven Ranney wells have been installed to produce almost 10 mgd. per well.—See lead article in this issue.

At the same time N. F. Glidden, Jr., vice-president, has announced that in the interest of simplification the company name has been changed to The Ranney Corporation. The new offices of The Ranney Corporation are located in the Heyburn Building, Louisville.

Neptune Meters in New Canadian Plant

● Neptune Meters, Ltd., of Canada has moved into its new plant recently completed in record time at Long Branch, near Toronto.

With a 400 ft. frontage on Lakeshore Road, the plant occupies 10 acres and offers 30,000 sq. ft. of floor space.

Designed by T. Pringle & Son, industrial engineers, the new plant of structural steel and brick construction was completed in remarkably short time because of important war contracts awarded Neptune Meters, Ltd.

According to W. T. Randall, vice president and general manager of Neptune Meters, Ltd., the building of this new plant was not alone the result of meter manufacturing requirements to meet increased meter business in Canada, but also because of large war contracts for precision instruments which have been awarded the company.

At least for the duration Neptune will also continue the operation of their old plant at 345 Sorauren Ave. in Toronto.

Pittsburgh Meter Stages Big Christmas Party

● Pittsburgh Equitable Meter Co. staged perhaps its largest annual Christmas Party for the youngsters of the employees of the company's main factory in Pittsburgh.

Carl Dixon, Shop Superintendent, acted as Master of Ceremonies, introducing Santa Claus who distributed worthwhile gifts to each kiddie in attendance.

Colonel Rockwell attended with two of his seven grandchildren and made a brief talk, as also did Captain Higgins, General Sales Manager.

WATERPLUG

1. For control of water pressure when running or seeping through cracks and other defects in masonry.
2. For caulking and sealing around pipes or other appliances which pierce masonry walls of tanks, sludge basins or foundations.
3. WATERPLUG is prepared ready for use by the addition of mixing water only. It hardens quickly and is permanent.
4. WATERPLUG protects lead, copper, brass and other pipes, subject to corrosion from free alkali in cements.
5. Troublesome water problems can be solved quickly and permanently by requesting free advice and methods of correction.

Standard Dry Wall Products, Inc.
BOX X NEW EAGLE, PENNA.

SEWERS LOCATED

With Flashlight Battery

A Sewer Finder has now been made; a transmitter and battery sealed in a short bakelite tube is pushed into sewers with rods or 100-foot lengths of steel snake to the obstruction or any desired distance and its location found on the surface with coil and phones, as in pipe finding.

The Sewer Locator was devised by an employe of the City of North Adams; over 25 years work showed the need and long personal experience gave opportunity to design and perfect the instrument.

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Charles J. Kupper
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Reports — Design
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Harry W. Clark, Associate
(Engineers (Est. 1869—Inc. 1924)
Channing Howard — Paul F. Howard
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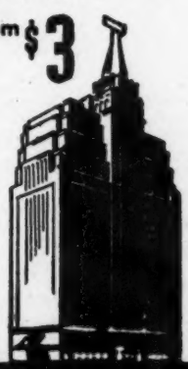

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Complete Sewer
Cleaning Equipment
Before you clean your sewers, don't fail to investigate our equipment. We supply a complete line of sewer cleaning apparatus—machines, sewer rods, cleaning tools. Machines may be purchased or leased.
Sewer rods and hand tools sent on free trial.
Manufacturing Sewer Cleaning Equipment Since 1901
Write for Catalog
W. H. STEWART

GASKET AND FORM
The Perfected Method for Making SEWER PIPE JOINTS OF CEMENT

- **No jute used—gasket centers spigot.**
- **Definite space in each joint for cement.**
- **Form confines cement-grout to lower portion of joint.**
- **Particularly advantageous in water-bearing trenches.**
- **Infiltration minimized.**

L. A. WESTON **Adams, Mass.**

The Meter-Master

RATE RECORDER FOR WATER METERS

Send For Literature

F. S. BRAINARD & CO.
240 Pulm Street, Hartford, Conn.

Dorrco Doings in 1941

Events are the great teachers. One Sunday morning in Hawaii did more to educate the American people than acres of pamphlets. I had heard a great publisher two nights before, telling of the woes and disunion that war would cause. And now . . .

We are all united now. I recall the prophecy Clarence Streit of "Union Now" made to me the night the Germans went into Holland: "I expect to see the American people pay heavily with blood and treasure for their blindness in refusing to see the world as it is."

We must hope that our job of winning the war will not prevent us from seeking at the same time a reasonable solution or pattern of life for the world that will postpone the next war indefinitely.

Democracy has to justify itself in Peace as in War and the former may prove more difficult.

RESEARCH

Our Westport Mill has been engaged in metallurgical researches, especially on the treatment of oxidized ores. A new microphotographic method, utilizing colored contact prints, for mineral identification and localization, has been developed and will be published this year. Base exchange principles have been applied to the purification of beet sugar juices. Basic sedimentation and classification studies are being continued.

PLANT ENGINEERING

Our Plant Engineering group has designed and specified complete plants in certain fields where we have special experience. Among interesting projects outside the U. S. were an alumina plant for Brazil, a metallurgical plant for Turkey and a proposed caustic soda plant in South America.

MAGNESIUM

At Dow's 50 million pounds a year magnesium-from-sea water plant in Texas, to be doubled in 1942, the settling of the magnesium hydroxide is carried out in several 200 ft. thickeners, preceded by smaller units for milk of lime.

ALUMINUM

Reynolds Metals Company's 280 ton a day aluminum plant at Sheffield, Ala. is using our equipment throughout the alumina plant for classification, thickening and washing at the "red mud" and "white mud" stations. Our machines and methods have also been used in expansions of the alumina plants of our old clients—the Aluminum Company of America and Aluminium Ltd.

NICKEL, MANGANESE, TUNGSTEN & ZINC

These metals are vital to defense and we have contributed towards the new production of all four. Classifiers for 12,000 tons more milling capacity at International Nickel's Sudbury property—classifiers and thickeners for the new manganese operations of Anaconda Copper and for the new tungsten milling of Nevada-Massachusetts —classifiers and thickeners for expansion in Hudson Bay's zinc production in Manitoba.

POTASH, PHOSPHATES & MAGNESITES

Our equipment is playing a part at Union Potash's plant at Carlsbad, N. M., where potash chemicals are made from sylvinite and langbeinite ores; at Phosphate Recovery's new phosphate rock concentrator in Florida; and at Northwest Magnesite's operations in Washington.

CEMENT

Closed circuit grinding, followed by thickeners and slurry mixers, continues to gain converts in the wet-process field. Latest additions are Universal Atlas, with a second new mill, located in Pennsylvania; Calaveras in California, with a modernization program; and Permanente in California, increasing capacity to 16,000 bbls. per day.

SPECIAL FOUNDRY SAND

Special grades of moulding sands are proving vital in making intricate aluminum castings for airplanes and high grade ferrous castings. A recently completed plant in New Jersey uses an ingenious combination of classifiers, a hydro-separator, a thickener and a Fahrenwald Sizer, to produce five grades of high specification core sand.

SANITATION FOR DEFENSE FORCES

Defense forces are being protected by a degree of sanitation unthought of in 1917-18. Dorr-equipped sewage plants at camps, air fields, bases and ordnance plants are treating 87 million gallons a day, equivalent to over a million men.

BIOFILTRATION

This improved method of sewage treatment is ideal for military camps and has made rapid strides—98 civilian and military installations to date, the largest at an army base for 50,000 troops.

MORE SANITATION FOR NEW YORK

The Coney Island plant is being doubled to 70 million gallons a day. Additional capacity is provided by Dorrco Monorakes, 250 ft. long, and our Flocculators, Detritors and bar screens.

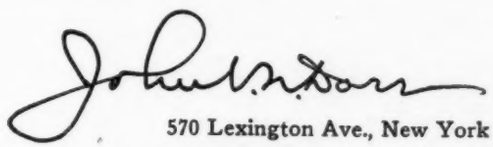
MECHANIZATION & WATER SOFTENING FOR KANSAS CITY

Plain Sedimentation tanks, built in 1926, are being equipped with our flocculators and clarifiers to clarify and soften 100-150 million gallons per day.

INDUSTRIAL WATER PURIFICATION

Ordnance and explosive plants have been installing our water purification equipment this year, including Radford Ordnance, Missouri Ordnance and the T.V.A. ammonia plant.

To friends all over the world I would say that I feel the solidarity and friendliness which our own international organization was able to achieve before the war must be typical of that which must prevail after the war, in order to reconcile political and spiritual growth with technical advancement and thus to save civilization.



570 Lexington Ave., New York

DORRCO

EMERGENCY PROTECTION FOR WATER SUPPLIES!

W&T CHLORINATION TRAILER BRINGS SAFETY WHERE IT'S NEEDED WITHOUT DELAY

This trailer-type mobile chlorinating unit... now in active production by Wallace & Tiernan... is specifically designed for positive protection of water supplies under emergency conditions. It provides for self-powered solution feed of chlorine over a wide range of application rates up to 300 lb. of chlorine per day.

The trailer is equipped with a complete set of accessories for emergency work, including all necessary connecting hose, corporation cocks, tools and other accessories for making emergency main connections. A W&T Hellige Comparator for assuring adequacy of treatment is self-illuminated.

Both trailer frame and chlorinator are ruggedly built for faithful performance under the strenuous conditions of transport and service which exist during emergencies. SA-125

• Data and experience gained by W&T technical experts in England under conditions like this has helped to guide the designers of this unit.

• America's foresighted municipalities are now equipping themselves with one or more of these W&T Chlorination Trailers. Already, they have been found useful in normal water system operation for secondary chlorination, meeting unusual load conditions, main sterilization.

WRITE TODAY FOR THESE AIDS TO EXTRA SECURITY

W&T Technical Publication 228 describes the new W&T Emergency Chlorination Trailer in detail... gives specifications.

W&T Technical Publication 225 gives a 7-point plan for building a sound defense for your water supply system, including data on emergency chlorination.

As in past emergencies W&T is putting forth every effort to meet the demands of the situation with standard Visible Vacuum Chlorinators or special equipment for any water treatment need. Valuable assistance on your specific problems is available without obligation. Just call your local W&T Representative or write direct to: